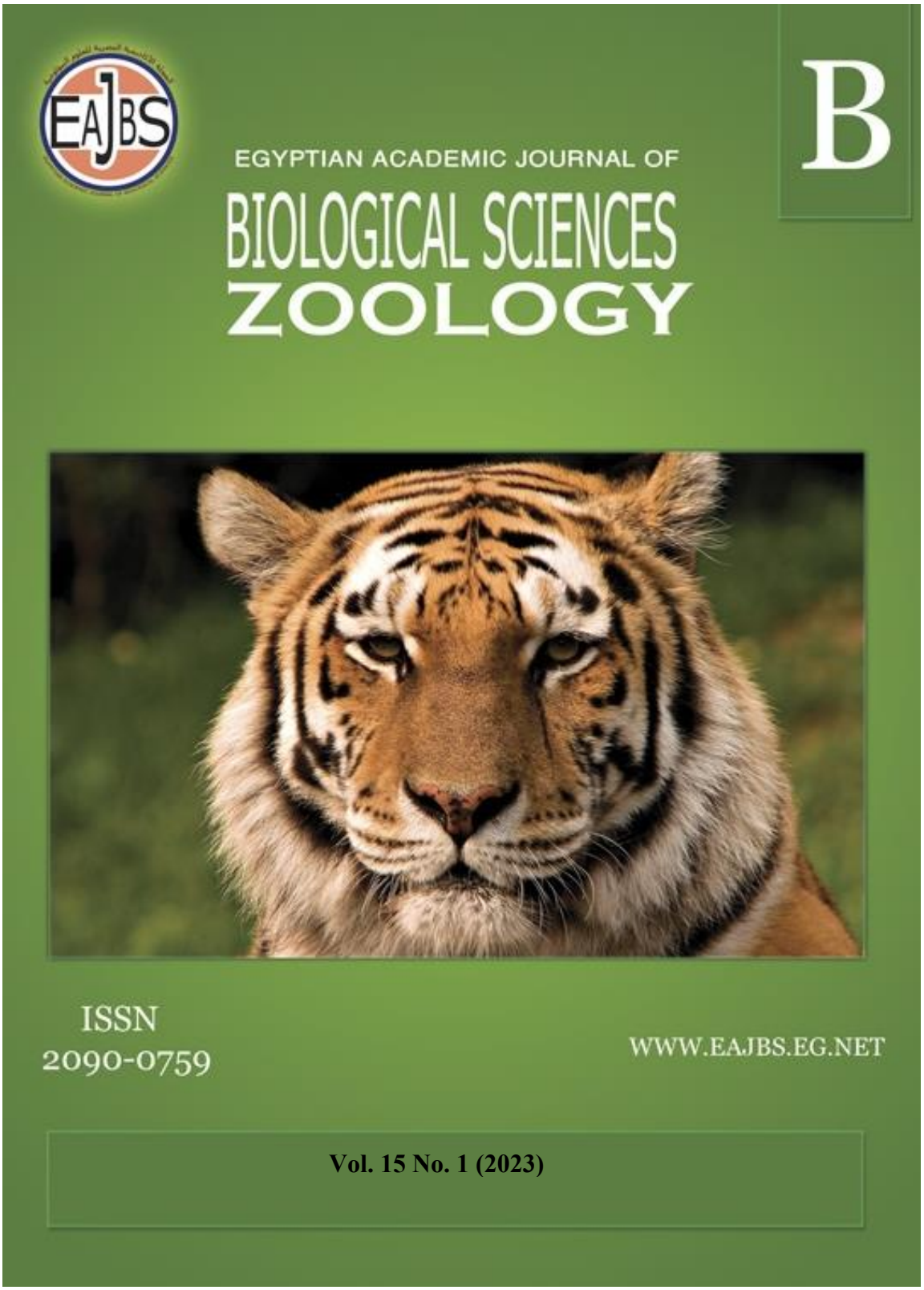

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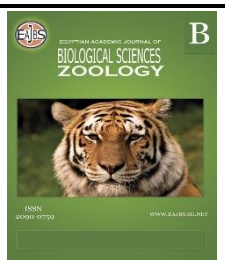

New Record of The Lesser Egyptian Gerbil, *Gerbillus gerbillus* (Olivier, 1801) from the Northern Nile Delta of Egypt

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A new population of *Gerbillus gerbillus* from the Mediterranean coastal land of the Nile Delta of Egypt (Baltim, Kafr El Shiekh) was discovered after the last record of Anderson in 1902. The genus *Gerbillus* is one of the important part of the fauna of mammals it is tolerate the desert dryness due to its different habitat structure. Thirteen specimens of *G. gerbillus* were collected and identified from the study area. Morphological measurements of the body and skulls indicated that the specimens of *G. gerbillus* from the northern Nile Delta were relatively larger compared to those that inhabit other areas in Egypt and Arabia. The sample measurements and their habitat in the study area are discussed in detail. Large parts of *G. gerbillus* habitats in the northern Nile Delta have been destroyed as a result of continuous human activities, which may lead to the disappearance of these habitats, including rodent species that play a critical role in the environmental balance.

INTRODUCTION

Many Egyptian mammals had been described especially by C. Linnaeus 1758, E. Geoffroy 1801, F. Cuvier 1826, and Hemprich & Ehrenberg 1832. William Edward De Winton 1902 undertook the revision, and completion and decided to publish a book entitled "Zoology of Egypt Part 2: Mammalia" when this work was cut short suddenly by John Anderson's death. Stanley Flower (1932) wrote a long article entitled "Notes on the recent mammals of Egypt". Osborn and Helmy (1980) published a comprehensive book entitled "The contemporary land mammals of Egypt Including Sinai". Richard Hoath (2009) wrote a book entitled "A field guide to the Mammals of Egypt". Basuony *et al.* (2010) published a book including order Chiroptera and marine mammals in both Arabic and English languages entitled "Mammals of Egypt: Atlas, Red Listing, and Conservation" and updated the mammalian list in Egypt.

The genus *Gerbillus* Desmarest, 1804 is the most diversified genus of rodents inhabiting North and East Africa, the Indian desert, and the Arabian Peninsula in arid and semi-arid habitats (Lay, 1983). Because of the variation in the habitat type and structure, these rodents compose a substantial constituent of the mammalian fauna as they are acclimatized to the desert's aridity (Lay, 1983; Granjon *et al*., 1999). The genus *Gerbillus* is divided into two groups, according to its external structure, the naked-footed gerbils (subgenus *Hendecapleura*), mainly found in salty and rocky landforms and the hairy-footed gerbils (subgenus *Gerbillus*) which mostly subsist and inhabit sandy deserts (Harrison and

Bates, 1991).

The present knowledge on the genus *Gerbillus* distribution in Egypt is depend on revisions of mammals in the Mediterranean coast, Western Desert, Nile Valley and Delta, and Eastern and Sinai Deserts (Flower, 1932; Osborn and Helmy, 1980; Saleh and Basuony, 1998; Basuony *et al*., 2010; Soliman and Mohallal, 2014). Records of species of the genus *Gerbillus* in Egypt appear in *G. amoenus* (De Winton, 1902), *G. andersoni* De Winton, 1902, *G. floweri* Thomas, 1919, *G. henleyi* (De Winton, 1903), *G. nanus* Blandford, 1875, *G. pyramidum* I. Geoffroy St-Hilaire, 1825, *G. perpallidus* Setzer, 1958 and *G. gerbillus* (Olivier, 1801) (Basuony *et al.*, 2010). The present study aims to recording the lesser Egyptian gerbil *G. gerbillus* from the northern Nile Delta of Egypt. Confirmation of species status is depended on morphologic, cranial, and dental characteristics.

MATERIALS AND METHODS

The Study Area:

The northern fringes of the Nile Delta consist of a flat expanse of sandy plain, locally known as *Barari* (wasteland) extending for up to about 10 km inland, with scattered dunes, and numerous sand mounds stabilized by phytogenic mounds. Dune types vary from simple crescent with south facing corner, to complex and deformed crescent, and small linear dunes. Maximum height is about 20 m, but the most common height is 2–3 m.

The current study is based on 13 specimens (12 males and 1 female) of the lesser Egyptian gerbil which were collected from Baltim region, an isolated area between agricultural fields and the Mediterranean Sea coast, at the northern Nile Delta of Egypt 31°34'08.9" N 31°13'56.7" E in May 2021 (Fig. 1). The live studied rodents were captured using Sherman traps baited with bread and peanut butter. Three consecutive nights were enough to collect the studied gerbils. Collected rodent samples were identified at the species level rely on the identification keys of Osborn and Helmy (1980) and Harrison and Bates (1991).

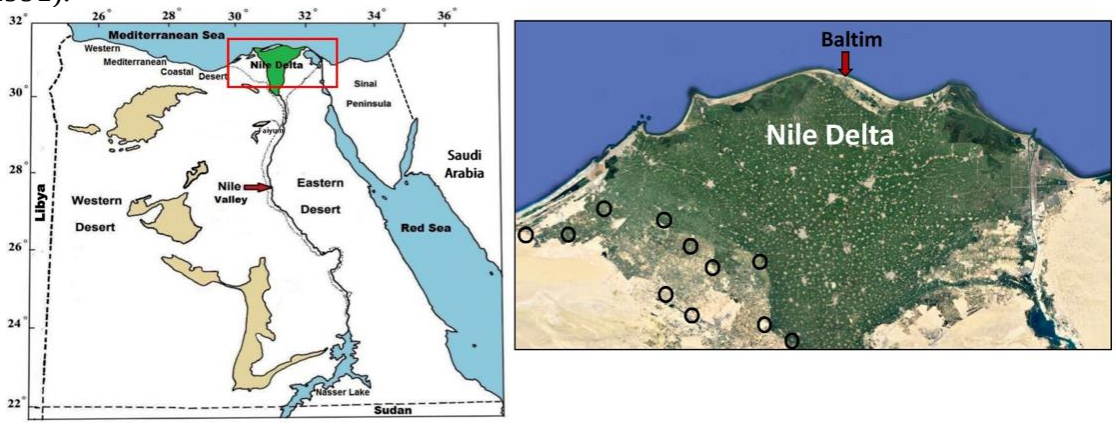

Fig. 1. Map of Egypt (left) and satellite image (right) showing the previous collection localities of *G. gerbillus* (circles) after Osborn and Helmy (1980) and the red arrow refers to the current study collection site (Baltim).

Morphological Measurements:

Four external measures, TBL, TL, EL, and HFL, were taken by a standard ruler. Twenty-eight cranial and fourteen dental and lower jaw measures were taken by a digital electronic caliper (150 mm) to the nearest 0.01 mm from each adult cranium.

The abbreviations used in the current study are listed in Table 1. The Skulls of the *G. gerbillus* samples used in the current study were deposited in Al-Azhar University Zoological Collection (AUZC), Faculty of Science, Al-Azhar University, Cairo, Egypt. The museum numbers of these samples were from m05347 to m05359.

Table 1. Definitions of the external, cranial, dental, and lower jaw measures of *G. gerbillus* samples used in this study.

External	
Head and body length: measured from the base of the tail to the tip of the snout.	HBL
Tail length: measured without adding the terminal pencil of hairs, from the base of the tail to its tip.	TL
Ear length: not including hair, measured from the pinna to the bottom boundary of the external auditory meatus.	EL
Hind foot length: without including the claw or hairs, measured from the extremity of the heel behind the *os calcis* to the extremity of the longest finger.	HFL
Body weight: measured in grams.	wt.
Cranium	
The greatest length of the cranium: regardless of what structure creates these points, the largest anteroposterior diameter of the skull should be measured dorsally from each extremity's most protruding point.	GLS
Condylobasal length: measured ventrally from the occipital condyle to the premaxilla's anterior extremity.	CBL
Basal length: measured ventrally from the junction of two occipital condyles to a premaxilla's anterior extremity.	BL
Basicranial length: measured ventrally, from the base of the presphenoid to the point between the two occipital condyles.	BCL
Nasal length: a measurement taken dorsally from the midpoint of two nasals to the tip of a nasal.	NL
Snout length: measured dorsally from the anterior of the lacrimal bone to the anterior extremity of the cranium.	SL
Palatal length: measured ventrally from the front extremity of the cranium to the tip of a palatine.	PL
The greatest length of the tympanic bulla: the longest bulla measured ventrally.	ABL
The greatest width of the tympanic bulla: the widest bulla measured ventrally.	ABW
Greatest breadth across the mastoid processes: the largest width, measured ventrally, between the two mastoid processes.	GBM
Zygomatic breadth: regardless of where this point lies along the length of the zygomatic arches measured dorsally, the largest breadth of the skull across the arches.	ZB
Pterygoid width: the maximum separation, measured ventrally, between the two pterygoid processes.	PtW
Least width of the cranium at the postorbital constrictions: the shortest distance between the two postorbital processes, measured dorsally.	PCW
Minimum Interorbital constriction width: the smallest breadth across the interorbital region.	MnIW
Maximum palatal width: the interior end of the upper jaws, measured ventrally.	MxPW
Minimum palatal width: the smallest snout width, measured ventrally.	MnPW
Width of incisors: the incisors' largest width measured ventrally.	IW
Depth of braincase: measured laterally from the lowest point dorsally to the highest point ventrally of the cranium.	DB
Prosthion: measured from the infraorbital foramen dorsally to the anterior extremity of the cranium.	IF
The distance between the two infraorbital foramens taken frontally.	IOF
Measured literally from the foramen magnum to the frontal midpoint.	FM
Palatal depth behind tooth row: measured laterally from the tip of an upper jaw to the same point on the cranium's roof.	PDT
Depth at infraorbital foramen: measured laterally from the infraorbital foramen to the above point at the roof of the skull.	DIF
Maximum width of the braincase: the width of the braincase at the posterior roots of the zygomatic arches.	MxWB
Width across the auditory meatuses: the distance between the two external auditory meatuses taken laterally.	WAM
Greatest width across the two occipital condyles.	OCW
The maximum width at the two orbital processes.	WOP
The diastema length of the upper jaw.	DLU
Molar premolar length: measured from the first premolar pm^1 to the last molar m^3 in the upper jaw.	MPU
The distance from the back of the crown of the last upper molar to the anterior extremity of a premaxilla.	MP
Maxillary tooth row: in the upper jaw, measured from the base of incisors to the end of the last molar.	MXTR
Mandible	
Mandibular tooth row: measured from the point between the incisors of the lower jaw to the last molar.	MT
Mandible length: measured from the lower jaw's midpoint between the incisors to the angular process.	M
The length of the incisors of the lower jaw.	InL
Mandibular height: the greatest height of the mandible taken laterally from the lower jaw at the base of the first molar.	MH
Lower jaw thickness: the greatest thickness of the mandible taken ventrally.	JT
The height of the angular-coronoid process.	ACP
The diastema length of the lower jaw.	DLL
Molar – premolar length of the lower jaw.	MPmL
The distance between the two last premolars of the lower jaw.	DLPm
The distance between the two condyloid processes of the lower jaw.	CD
The distance between the two angular processes of the lower jaw.	APD

RESULTS AND DISCUSSION

G. gerbillus Distribution

The type locality of the l`esser Egyptian gerbil, *G. gerbillus*, (Olivier, 1801) is Giza province (Egypt). *G. gerbillus* was previously named *Dipus gerbillus* Olivier, 1801; *G. aegyptius* Desmarest, 1804 and *G. asyutensis* Setzer, 1960. *G. gerbillus* is typically found in the North African deserts, ranging from Mauritania to Morocco, Algeria, Tunisia, Libya to Egypt, Sudan, parts of Niger, Uganda, Chad, Mali, Sinai, Palestine, and Jordan (Osborn and Helmy, 1980; Lay, 1983; Harrison and Bates, 1991; Basuony *et al*., 2010). In Egypt, *G. gerbillus* is distributed in the Sinai Peninsula, Eastern Desert, western margins of the Nile Delta (Fig. 1), and Western Desert (Osborn and Helmy, 1980; Basuony *et al*., 2010).

G. gerbillus Description

The dorsum coloration of *G. gerbillus* is orangish to reddish-orange sandy buff (significantly lighter than other *Gerbillus* species) and lacks brownish-tipped hairs. The tail is long, bicolored, and has a well-developed pencil. The back foot are long and mostly hairy. There are white areas underneath the limbs and abdomen. Behind the ears and above the eyes, there are white marks. Margin of ears is either faintly or not pigmented (Fig. 2). Soles are not pigmented. Ear length 11.77±0.60 mm less than one-half hind foot length 31.23±3.63 mm (Table 2). The posterior margin of the nasal bone is rounded, the cranium with big tympanic bulla, comparatively long palatine foramina, and short incisive foramina (Fig. 3). These findings were in agreement with those mentioned by Osborn and Helmy (1980) and Abu-Baker and Amr (2003).

External Measurements

The present study showed the lesser Egyptian gerbil is a medium-sized gerbil and has an average body weight of 34.69±4.47 g ranging between 29-44.52 g (Table 2). The average head and body length was 106.92±4.66 mm with measurements ranging between 95-112 mm, the average tail length was 133.69±7.17 mm with measurements ranging between 122-145 mm, the averages of body length to head and tail length (TL/HBL x 100%) were 125±0.08 with measurements ranging between 114-139%. The average hind foot length was 31.23±3.63 mm with measurements ranging from 21-37 mm and the average ear length was 11.77±0.60 mm with measurements ranging from 11-13 mm (Table 2). These measurements were slightly greater than that reported by Abu-Baker and Amr (2003) they mentioned the average *G. gerbillus* weight was 19.89±2.87 g, and head and body length was 84.67±3.53 mm. The average tail length was 125.38±6.98 mm, TL/HBL 150.26±8.37%. The average length of the hind foot was 29.67±1.57 mm and the ear length was 12.5±0.62 mm (Table 3). Harrison and Bates (1991) reported that *G. gerbillus* samples from Arabia had 93.3±10.3 mm for HBL, 116.0±7.7 mm for TL, TL/HBL 124.33±7.31%, HFL 28.3±1.4 mm and EL was 11.7±1.0 mm (Table 3).

Osborn and Helmy (1980) stated that the average body weight of *G. gerbillus* as mentioned as *G. g. gerbillus* subspecies, collected from margins of the Nile Delta (Fig. 1), was 24.2 g, the head and body length average of 90 mm, the average tail length 124 mm, TL/HBL 138%, the average hind foot length was 30.2 mm and the length of the ear 13.2 mm (Table 3). The external measurements of *G. g. gerbillus* reported by Osborn and Helmy (1980) were smaller than that measured in the current study in body weight, HBL, TL, and HFL while ear length and the ratio of TL/HBL were larger in Osborn and Helmy study than in the current study. Anderson (1902) reported that *G. gerbillus* specimen from Giza province had 85 mm for HBL, 127 mm for TL, 30 mm for HFL, and 13 mm for EL, and *G. gerbillus* specimen from Sakkarah region had 87 mm for HBL, 118 mm for TL, 27 mm HFL and 13 mm for EL (Table 3). The study of Anderson (1902) revealed a larger ear length of *G. gerbillus* than reported by Osborn and Helmy (1980), Harrison and Bates (1991), Abu-Baker and Amr (2003), and the current study.

In the present study, the population of *G. gerbillus* from the northern Nile Delta was heavier, 34.69±4.47 g, than *G. gerbillus* from the other populations (Tables 2 and 3). The explanation of this body mass difference refers to in the desert sandy areas, *G. gerbillus* cohabitated with *G. pyramidum* (which is larger than *G. gerbillus)*, whereas in the northern Nile Delta, it cohabitated with *G. andersoni* (which is approximately similar in size) and had a competitive advantage over the latter.

Cranial Measurements

The skull of *G. gerbillus* has small tympanic bulla with an average ABL of 11.29±0.91 mm and ABW 7.81±0.76 (Table 2) without going past the supraoccipital bone. The nasal bone's back end is one of the important differences between *G. gerbillus* which has a rounded end and *G. andersoni* which has a truncated end (Fig. 4). These results agreed with Harrison and Bates (1991) and Abu-Baker and Amr (2003).

Fig. 2. Live specimen of *G. gerbillus* from the northern Nile Delta.

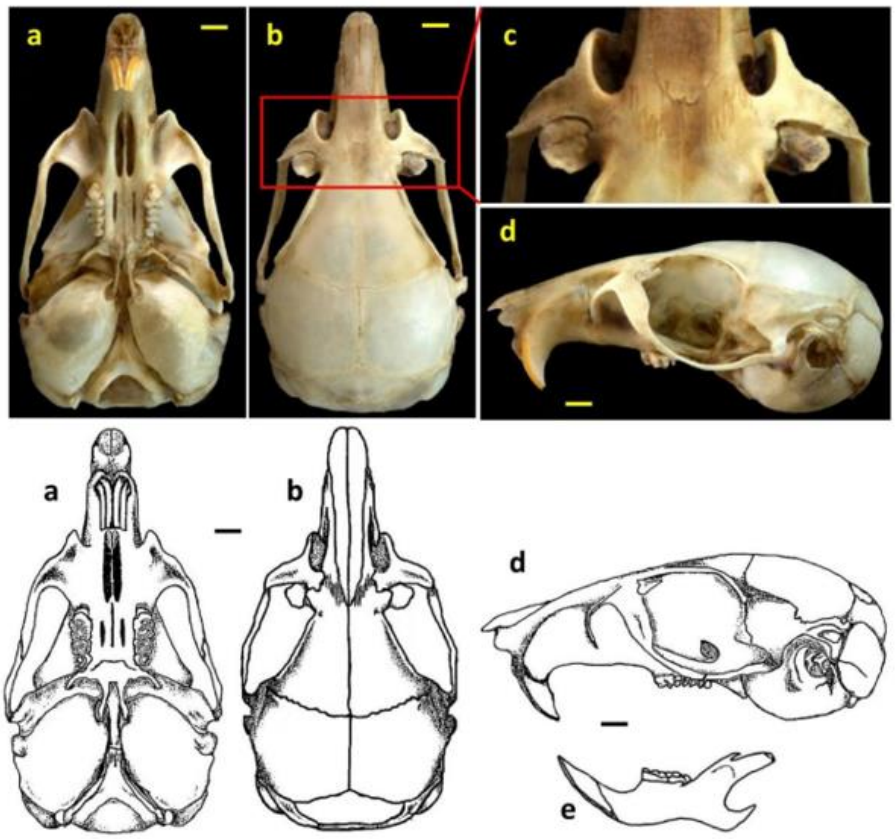

Fig. 3. *G. gerbillus* skull from the northern Nile Delta. a; ventral view, b; dorsal view, c; enlarged posterior margin of the nasal bone, d; lateral view of the cranium, and e; lateral view of the lower jaw. Scale bar = 20 mm. Skull drawing after Abu-Baker and Amr (2003).

Table 2. External, cranial, and dental measurements of *G. gerbillus* specimens from the northern Nile Delta. Unless otherwise stated, all measures are in millimeters.

External measurements			
Symbol		**Symbol**	
HBL	106.92±4.66 (95.0-112.0)13	**HFL**	31.23±3.63 (21.0-37.0)13
TL	133.69±7.17 (122.0-145.0)13	**EL**	11.77±0.60 (11.0-13.0)12
TL/HBL x 100%	125±0.08 (114-139)13	**wt. (g)**	34.69±4.47 (29.0-44.52)13
Cranial measurements			
GLS	31.06±1.40 (29.27-32.96)13	**MxPW**	6.53±0.15 (6.20-6.98)13
CBL	30.35±1.56 (28.60-32.49)13	**MnPW**	4.05±0.27 (3.58-4.54)13
BL	28.21±1.50 (26.40-30.43)13	**IW**	3.09±0.26 (2.70-3.63)13
BCL	9.40±0.71 (8.32-10.56)13	**DB**	10.44±0.32 (9.72-10.85)13
NL	12.60±0.90 (11.49-13.95)13	**IF**	10.96±0.66 (9.98-12.0)13
SL	14.28±1.03 (12.97-15.81)13	**IOF**	3.97±0.34 (3.63-4.53)13
PL	18.92±1.10 (17.38-20.49)13	**FM**	15.82±0.68 (14.82-16.83)13
ABL	11.29±0.91 (10.15-12.82)13	**PDT**	9.84±0.25 (9.31-10.09)13
ABW	7.81±0.76 (6.81-8.87)13	**DIF**	8.53±0.66 (7.74-9.45)13
GBM	16.12±0.90 (14.83-17.32)13	**MxWB**	15.27±0.51 (13.92-15.67)13
ZB	17.60±0.42 (16.97-18.11)12	**WAM**	14.04±0.69 (12.92-15.04)13
PtW	7.37±0.30 (6.96-7.83)13	**OCW**	6.15±0.34 (5.70-6.64)13
PCW	11.55±0.83 (10.58-12.90)13	**WOP**	10.34±0.46 (9.35-11.23)13
MnIW	6.49±0.45 (5.63-7.26)13	**DLU**	10.80±0.72 (9.54-11.62)13
Dental and lower jaw measurements			
MPU	4.43±0.21 (4.12-4.84)13	**JT**	1.81±0.23 (1.42-2.15)13
MP	17.72±1.09 (16.66-19.29)13	**ACP**	8.21±0.29 (7.57-8.61)13
MXTR	15.19±0.73 (14.25-16.14)13	**DLL**	5.33±0.29 (4.94-5.86)13
MT	8.92±0.59 (8.02-9.71)13	**MPmL**	4.76±0.25 (4.35-5.05)13
M	15.56±0.49 (14.45-16.26)13	**DLPm**	7.56±0.36 (7.03-8.14)13
InL	5.87±0.61 (5.23-6.68)13	**CD**	13.71±0.72 (12.72-14.82)13
MH	4.41±0.29 (4.04-4.98)13	**APD**	12.90±1.20 (10.19-13.86)13

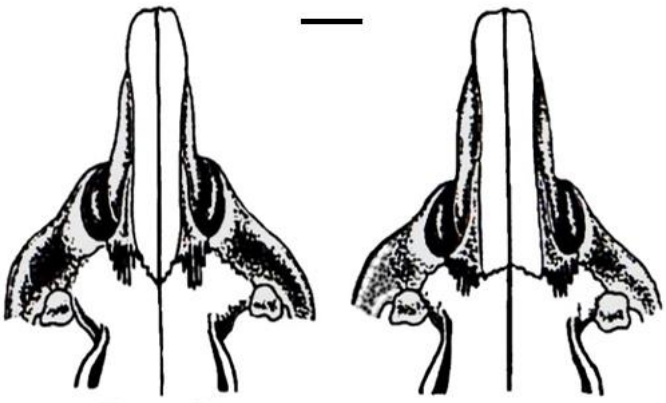

Fig. 4. Dorsal view of the rostrum of *G. gerbillus* (left) and *G. andersoni* (right) showing the posterior margins of the nasal. Scale bar = 20 mm, after Harrison and Bates (1991).

The largest length of the cranium (GLS) of *G. gerbillus* between 29.27-32.96 mm slightly greater than that mentioned by Abu-Baker and Amr (2003) 26.5–29 mm, Harrison and Bates (1991) 27.3-28.2 mm and Osborn and Helmy (1980) 25.8-30 mm (Table 3). Rostrum is rather long and slender. The snout length is between 12.97-15.81 mm. The nasal bone well projecting in front of the incisors. NL between 11.49-13.95 mm. Osborn and Helmy (1980) reported the average NL was 10.4 mm and measurements ranging from 9.2-11.4 mm which is smaller than that of the present study (Table 3). Braincase inflated. The average length of DB was 10.44±0.32 mm and measurements ranging 9.72-10.85 mm. The

average zygomatic breadth was 17.60±0.42 mm and the measurements ranging 16.97-18.11 mm (Tables 2 and 3) which is larger than that reported by Abu-Bakr and Amr (2003) 15.08 mm and Harrison and Bates (1991) 15.4 mm (Table 3). The posterior mastoid chamber is more inflated than the inferior one but never reaches the supraoccipital. The cranial measurement ratios are shown in Table 4. These larger skull dimensions of *G. gerbillus* in the present study may reflect the adaptations of that gerbils to inhabit semi-arid habitats in the northern Nile Delta.

Table 3. Comparison of external, cranial, and dental measurements of *G. gerbillus* samples from the northern Nile Delta (the present study) and the previous studies. Unless otherwise stated, all measures are in millimeters.

Symbol	This study	Abu-Baker & Amr (2003)	Harrison & Bates (1991)	Osborn & Helmy (1980)	Anderson (1902)
External measurements					
HBL	106.92±4.66 (95.0-112.0)13	84.67±3.53 (80.0-91.0)18	93.3±10.3 (92.0-100.0)6	90.0(77.0-104.0)164	87
TL	133.69±7.17 (122.0-145.0)13	125.38±6.98 (116.0-140.0)16	116.0±7.7 (110.0-130.0)6	124.0(107.0-137.0)161	118
TL/HBL x %	125±0.08 (114-139)13	150.26±8.37 (137.21-166.67)14	124.33±7.31 (119.57-130.0)6	138(118.0-161.5)159	135.63
HFL	31.23±3.63 (21.0-37.0)13	29.67±1.57 (24.0-31.0)18	28.3±1.4 (27.0-30.0)6	30.2(28.0-32.0)175	27
EL	11.77±0.60 (11.0-13.0)12	12.5±0.62 (11.0-13.0)18	11.7±1.0 (10.0-13.0)6	13.2(12.0-15.5)171	13
wt. (g)	34.69±4.47 (29.0-44.52)13	19.89±2.87 (14.0-26.0)18	---	24.2(15.0-34.7)112	---
Cranial measurements					
GLS	31.06±1.40 (29.27-32.96)13	28.04±0.65 (26.5-29.0)16	27.9±0.3 (27.3-28.2)6	28.0(25.8-30.0)142	28.5
CBL	30.35±1.56 (28.60-32.49)13	24.17±0.64 (22.9-25.1)16	24.8±0.3 (24.3-25.0)6	---	---
BL	28.21±1.50 (26.40-30.43)13	22.1±0.76 (20.7-23.3)16	---	---	23.8
MnIW	6.49±0.45 (5.63-7.26)13	5.52±0.25 (5.1-5.9)17	5.5±0.2 (5.3-5.8)7	5.6(5.0-6.4)159	5.5
ZB	17.60±0.42 (16.97-18.11)12	15.08±0.36 (14.5-15.8)15	15.4±0.1 (15.2-15.5)4	15.2(13.7-16.2)122	15.5
MxWB	15.27±0.51 (13.92-15.67)13	---	13.3±0.2 (13.0-13.5)7	13.5(12.9-14.2)156	---
NL	12.60±0.90 (11.49-13.95)13	---	---	10.4(9.2-11.4)132	10.3
ABL	(10.15-12.82)13	---	10.4±0.3 (10.0-10.7)7	---	---
Dental measurements					
MPU	4.43±0.21 (4.12-4.84)13	---	3.8±0.2 (3.3-3.9)7	---	3.9
MP	16.66-19.29)13	---	16.0±0.7 (15.0-16.9)7	---	---

Table 4. Ratios of cranial and dental measurements of *G. gerbillus* samples from the northern Nile Delta of Egypt.

Symbol		Symbol	
NL/GLS	0.41±0.02 (0.38-0.43)13	**IOF/GLS**	0.13±0.01 (0.11-0.15)13
SL/GLS	0.46±0.01 (0.43-0.48)13	**MxWB/GLS**	0.49±0.02 (0.47-0.52)13
PL/GLS	0.61±0.01 (0.58-0.63)13	**WAM/GLS**	0.45±0.01 (0.43-0.47)13
ABL/GLS	0.36±0.02 (0.34-0.39)13	**OCW/GLS**	0.20±0.01 (0.18-0.22)13
ABW/GLS	0.25±0.02 (0.23-0.28)13	**OCW/MxWB**	0.40±0.02 (0.36-0.44)13
GBM/GLS	0.52±0.01 (0.51-0.55)13	**OCW/DB**	0.59±0.02 (0.56-0.63)13
ZB/GLS	0.57±0.01 (0.54-0.58)12	**MPU/GLS**	0.14±0.01 (0.13-0.17)13
PtW/GLS	0.24±0.01 (0.23-0.25)13	**MPU/IM**	0.25±0.02 (0.23-0.28)13
PCW/GLS	0.37±0.02 (0.35-0.40)13	**IM/GLS**	0.57±0.01 (0.55-0.59)13
MnIW/GLS	0.21±0.01 (0.19-0.22)13	**MxTR/GLS**	0.49±0.01 (0.47-0.51)13
MxPW/GLS	0.21±0.01 (0.20-0.22)13	**MxTR/IM**	0.86±0.02 (0.84-0.88)13
MnPW/GLS	0.13±0.01 (0.12-0.15)13	**M/GLS**	0.50±0.02 (0.48-0.53)13
CAW/GLS	0.10±0.01 (0.09-0.12)13	**MT/M**	0.57±0.03 (0.51-0.61)13
DB/GLS	0.34±0.01 (0.32-0.35)13	**ACP/M**	0.53±0.01 (0.52-0.54)13
IF/GLS	0.35±0.01 (0.33-0.37)13	**DLL/M**	0.34±0.02 (0.32-0.36)13

In the current study, the upper incisor of *G. gerbillus* grooved. First labial and lingual cusps of the upper first molar opposite. The five tubercles on the first upper molar are grouped in three rows and are continuous. The largest row, the first, bears just one tubercle. The second row's tubercles are typically fused, although they are not connected to the third row. In the third row, two tubercles are invariably fused. The second molar has two rows of four tubercles, with the cusps mostly fused together. The third molar's cusp is the only one. The molars in the lower jaw resemble those in the upper jaw extremely closely. The first molar's cusps are primarily united, while the second molar's cusps are separated. Also, one cusp in the third molar (Fig. 5**).** These results agreed with Osborn and Helmy (1980) and Abu-Baker and Amr (2003).

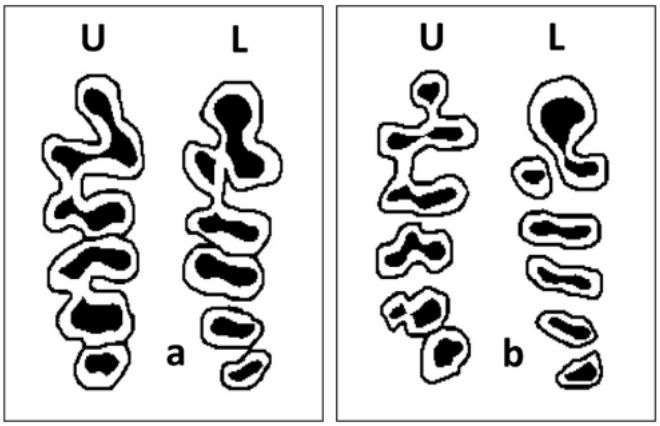

Fig. 5. Crown view of the left upper (U) and right lower (L) molars of mature (a) and immature (b) of *G. gerbillus*, after Osborn and Helmy (1980).

Palm and sole of *G. gerbillus* completely haired. Sole not pigmented. The back foot with lobed and large postdigital pad and inconspicuous posthallucal tubercle. Front foot with one soft and large postdigital pad bearing proximal accessory lobe (Fig. 6). These results are in agreement with Osborn and Helmy (1980).

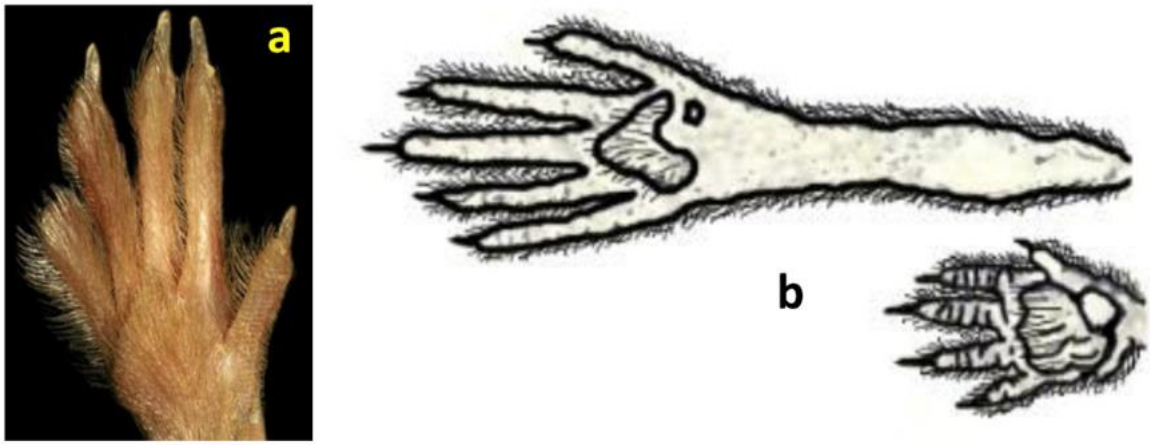

Fig. 6. Palms and soles of *G. gerbillus.* (a) the current study and (b) after Osborn and Helmy (1980).

G. gerbillus generally inhabits areas dominated by *Haloxylon persicum* present in patches of dunes. *G. gerbillus* was reported from sandy patches in cultivated areas and palm groves in the Nile Delta margins (Fig. 1) and Nile Valley (Osborn and Helmy, 1980). *G. gerbillus* is found around salt marshes with *Nitraria retusa* (Fig. 7).

Fig. 7. The habitat type of *G. gerbillus* at the northern Nile Delta.

Hamimi *et al.* (2020) reported that one of the biggest deltas in the world is the Egyptian Nile Delta. Desert forms its eastern and western boundaries. At Cairo, the river splits into Damietta and Rosetta, which discharge through the triangular-shaped alluvial plain and run north into the Mediterranean Sea. This is where the river reaches its apex. The Nile Delta's sedimentary sequence is around 4000 meters thick and primarily made up of

gravel and sand, with a thin layer of clay covering it. Five delta stages, including the Eonile Delta, Paleonile Delta, Protonile Delta, Prenile Delta, and NeoNile Delta, may be found in the geologic history of the Nile Delta, which dates back to the late Miocene.

The Nile Delta's length from south to north is about 170 km, and its northern width from east to west is about 220 km. The estimated area of the Nile Delta is about 22000 km^2 and comprises about 63% of the fertile cultivated land in Egypt (Abu Al-Izz, 1971). During the last 5000 years, the most important factor affecting this region's habitat's flora and fauna composition is the human impact. Its vegetation is substantially weeds associated with the crops in the urban habitat and cultivated lands (El-Sheikh, 1996; Shaltout and El-Sheikh, 2003). In the northern Nile Delta, drains were constructed to minimize salinity hazards and water-logging and hence the cultivation of some salt-tolerant crops (Shaltout *et al.*, 1995). The vegetation communities of the Deltaic Mediterranean coast differ from that of the Nile Delta rest. The Mediterranean coastal vegetation is a series of well-distinguished distinct habitats and plant communities. The xerophytic, marsh, and maritime plant communities in this region are mainly influenced by increased rainfall, better climate, modified wind, and the soil's physical and chemical nature. Human impacts are still relatively low, compared with that of the Nile Delta rest (Shaltout *et al*., 1995; Zahran and Willis, 2009).

In the current study, the northern Nile Delta gerbils were collected from an area of partly vegetated, dunes and elevated patches of sand sheets between the cultivated and the Mediterranean coastline (Figs. 1 and 7). The area is characterized by a relatively dense vegetation cover, reaching up to 35%, extending over the area from just above the supratidal marine zone, southwards for up to about 5 km in places. The plant cover is dominated by *Tetraena alba* (synonym *Zygophyllum album*) which is a very common succulent desert plant in the region. Halophytes grow densely in low-lying spots and include *Arthrocnemum glaucum, Tamarix nilotica,* and *Alhagi graecorum*. A more diverse cover of ephemeral vegetation appears in the area following the winter rain. Some of these plants capture wind-blown sand, forming small phytogenic mounds. The common plant species recorded in these habitats are *Elymus farctus, Alhagi graecorum, Cynodon dactylon, Heliotropium curassavicum, Stipagrostis lanata, S. scoparia, Thymelaea hirsuta, Moltkiopsis ciliata, Asparagus stipularis, Panicum turgidum, Phragmites australis, Pancratium maritimum, Heliotropium digynum* and *Cressa cretica* (Yunker and Guirgis, 1969; Ayyad *et al*., 1993). In addition, several species of cultivated or ornamental, mostly non-native plants such as *Ficus retusa, Cupressus sempervirens, Bougainvillea sp., Phoenix dactylifera, Delonix regia,* and *Ricinus communis* also occur in the area (Zahran and Willis, 2009).

Zahran *et al*. (1990) mentioned that the vegetation types of the Deltaic Mediterranean coast are divided into four main habitats: sand formations, salt marshes, fertile non – cultivated land, and reed swamps. The sand formations are dominated by *Alhagi graecorum, Elymus farctus, Cynodon dactylon, Stipagrostis lanata, Heliotropium curassavicum, Thymelaea hirsuta, Asparagus stipularis, Moltkiopsis ciliata, Pancratium maritimum, Cressa cretica* and *Phragmites australis*. The salt marshes are dominated by *Limbarda crithmoides, Zygophyllum aegyptium, Juncus acutus, Arthrocaulon macrostachyum* (synonym *Arthrocnemum macrostachyum*), and *Halocnemum strobilaceum*. In the fertile non–cultivated lands *Cynodon dactylon, Alhagi graecorum* and *Heliotropium curassavicum* are the dominants. In the reed swamps, *Typha domingensis* is dominant (Zahran and Willis, 2009).

The salt marshes and sand formations are the most detectable habitat types in the northern Nile Delta study area. The vegetation in this area was classified into nine groups, five of which were detected on the salt marshes *Halocnemum strobilaceum, Tetraena alba* (synonym *Zygophyllum album*), *Arthrocnemum glaucum, Juncus rigidus* and *Juncus acutus.* The remaining four groups were detected in the sand formations *Suaeda pruinosa, Stipagrostis scoparia, Echinops spinosus* and *Lycium europaeum* (Zahran and Willis, 2009).

Most of the areas inhabited by *G. gerbillus* in the northern Nile Delta have been fragmented and destroyed as a result of continued human activities in that critical habitat. It is expected that the remaining *G. gerbillus* population in this area will disappear as a result of this devastating impact on their habitats.

Conclusion

A new record, after Anderson in 1902, for the existence of *G. gerbillus* from the northern Nile Delta is confirmed. The body, dental, and skull measurements of the lesser Egyptian gerbil *G. gerbillus* from the study area indicated that this isolated population was relatively larger when compared to those that inhabit other areas in Egypt and Arabia.

REFERENCES

Abu Al-Izz, M.A. (1971). Landforms of Egypt. American University Press, Cairo, xv+281 pp.

Abu-Baker, A.M. and Amr, Z. (2003). A morphometric and taxonomic revision of the genus *Gerbillus* (Mammalia, Rodentia, Gerbillidae) in Jordan with notes on its current distribution. *Zoologische Abhandlungen (Dresden),* 53: 177-204.

Anderson, J. (1902). Zoology of Egypt: Mammalia. Revised and completed by W.E. De Winton. London: Hugh Rees, Limited, 124 Pall Mall. pp. 552.

Ayyad, M., Kassas, M., Springuel, I. and Zahran, M. (1993). Plant Ecology. In M. Kassas (ed.) Habitat Diversity: Egypt, Publications of National Biodiversity Unit, Cairo, No. 1. 19-62.

Basuony, M.I.; Gilbert, F. and Zalat, S. (2010). Mammals of Egypt: atlas, red listing, and conservation. Ministry of State for Environmental Affairs, Cairo. pp. 286.

El-Sheikh, M.A. (1996). Ruderal plant communities of the Nile Delta region. Ph.D. Thesis, Tanta University, Tanta. pp. 173.

Flower, S. (1932). Notes on the recent mammals of Egypt, with a list of the species recorded from that Kingdom. *Proceedings of the Zoological Society, London,* 110: 368-450. https://doi.org/10.1111/j.1096-3642.1932.tb01081.x

Granjon, L.; Bonnet, A.; Hamdine, W. and Volobouev, V. (1999). Reevaluation of the taxonomic status of North African gerbils usually referred to as *Gerbillus pyramidum* (Gerbillinae: Rodentia): chromosomal and biometrical data. *Zeitschrift für Säugetierkunde,* 64: 298-307.

Hamimi, Z.; El-Barkooky, A.; Frías, J.M.; Fritz, H. and El-Rahman, Y. (2020). The Geology of Egypt. Springer Nature Switzerland. pp. 711.

Harrison, D.L. and Bates, P.J. (1991). The Mammals of Arabia. Harrison Zoological Museum Publication. Kent, England. pp. 354.

Hoath, R. (2009). A Field Guide to the Mammals of Egypt. The American University in Cairo Press. pp. 320. https://www.jstor.org/stable/j.ctt15m7mh6

Lay, D.M. (1983): Taxonomy of the genus *Gerbillus* with comments on the applications of generic and sub-generic names and an annotated list of species. *Zeitschrift für Säugetierkunde,* 48: 329-354.

Osborn, D. and Helmy, I. (1980). The contemporary land mammals of Egypt (including Sinai). *Fieldiana Zoology., New Series,* No. 5: 1-579. DOI: https://doi.org/10 5962/bhl.title.2801

Saleh, M.A. and Basuony, M.I. (1998). A contribution to the mammalogy in the Sinai Peninsula. *Mammalia,* 62(4): 557-575. https://doi.org/10.1515/mamm

Setzer, H. (1958). The Jerboa of Egypt. *Journal of the Egyptian Public Health Association,* 33: 87-94.

Setzer, H. (1960). Two new mammals from Egypt. *Journal of the Egyptian Public Health Association,* 35 (1). 1-5.

Shaltout, K.H. and El-Sheikh, M.A. (2003). Vegetation of the urban habitats in the Nile Delta region, Egypt. *Urban Ecosystems*, 6: 205-221. DOI:10.1023/A: 1026105612771

Shaltout, K.H.; El–Kady, H.F. and Al-Sodany, Y.M. (1995). Vegetation analysis of the Mediterranean region of Nile Delta. *Vegetatio*, 116: 73-83. DOI:10.1007/ BF00045280

Soliman, S. and Mohallal, E.M. (2014). A survey of the mammalian fauna of Siwa Oasis, Egypt. *Egyptian Journal of Zoology*, 61(61): 171-186. DOI: 10.12816/0005514

Yunker, C.E. and Guirgis, S.S. (1969). Studies of rodent burrows and their ectoparasites in the Egyptian Desert, 1: Environment and microenvironment; some factors influencing acarine distribution. *Journal of the Egyptian Public Health Association*, 44(5): 498-542. PMID: 5393829

Zahran, M.A. and Willis, A.J. (2009). The vegetation of Egypt. Springer Science + Business Media B. V. pp. 424.

Zahran, M.A.; El-Demerdash, M.A. and Mashaly, I.A. (1990).Vegetation types of the deltaic Mediterranean coast of Egypt and their environment. *Journal of Vegetation Science*, 1(3): 305-310. https://doi.org/10.2307/3235705

ARABIC SUMMARY

تسجيل جديد للجربوع المصري الصغير *Gerbillus gerbillus* (Olivier, 1801) من شمال دلتا النيل في مصر

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قسم علم الحيوان – كلية العلوم – مدينة نصر – القاهرة – مصر

تم اكتشاف عشيرة جديدة من نوع *Gerbillus gerbillus* من المنطقة الساحلية للبحر المتوسط في شمال دلتا النيل في مصر بعد آخر تسجيل لأندرسون 1902. بسبب الاختلاف في بنية موئلها، يشكل جنس *Gerbillus* عنصرًا مهمًا في الحيوانات الثديية حيث يتأقلم مع جفاف الصحراء. تم جمع وتعريف ثلاثة عشر عينة من *G. gerbillus* من منطقة الدراسة. وأشارت القياسات المورفولوجية للجسم والجماجم إلى أن عينات *G. gerbillus* من شمال دلتا النيل كانت أكبر نسبيًا مقارنة بتلك العشائر التي تعيش في مناطق أخرى في مصر والجزيرة العربية. وتمت مناقشة قياسات هذه العينات وموئلها في منطقة الدراسة بالتفصيل. وأن تدمير أجزاءً كبيرة من *موائل G. gerbillus* في شمال دلتا النيل نتيجة الأنشطة البشرية المستمرة قد يؤدي إلى اختفاء هذه الموائل بما فيها من أنواع من القوارض التي لها دور حيوي في التوازن البيئي.