

A Preliminary Study of *Golunda ellioti* Gray, 1837 (Rodentia: Muridae) in Iran

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Abstract: Specimens of *Golunda ellioti* (Indian Bush Rat) were collected from several localities in the south of Kerman Province, Southeastern Iran during a zoological survey in August 2010. This species is endemic to the Indian subcontinent and has recently extended its distribution further west. In this study, morphological and morphometric characteristics as well as some biological characteristics of this species were investigated.

Key words: Rodentia, *Golunda ellioti*, Kerman Province, Iran

Introduction

Rodentia is the largest mammalian order with around 2277 species worldwide (MUSSEY, CARLETON 2005), and it accounts for half of all living mammals. The total number of identified rodent species in Iran has reached 73, distributed among 30 genera (38.2% all mammalian species of Iran) and as such is considered as the most diverse orders of mammals in the region (KARAMI *et al.* 2008). Rodents are found on all continents and in markedly different environments. They are generally considered as pests due to the economic losses caused to agriculture and their potential to spread disease (MEERBURG *et al.* 2009, ETEMAD 1978, CORBET, SOUTHERN 1977, ÖZSAN *et al.* 1974a,b). The genus *Golunda* GRAY, 1837 belongs to the family Muridae represented by only one species, the Indian Bush Rat or coffee rat, *Golunda ellioti* GRAY, 1837 (MUSSEY, CARLETON 2005, ELLERMAN, MORRISON-SCOTT 1951, CORBET, 1978).

The type locality of this species is India. *Golunda ellioti* was reported by MISONNE (1991) from Kerman Province (40 km Southeast of Jiroft County) located in Southeast Iran on the basis of two specimens collected in 1989 by NAZARI, FRID (1991)

(Iranian Research Institute of Plant Protection, Tehran). The colour of the dorsal part of the body is grayish, yellowish brown or reddish brown and the colour of the belly is light gray, bluish gray, or whitish. The body is thick and heavy and the head is short and rounded. The tail is covered with coarse, short hairs. The ear is circular covered with short buff hairs. The feet are stout with four digits on the fore-feet and a short vestigial thumb. The hind sole is naked and blackish. Incisors are longitudinally grooved and reddish. The surface of grinding teeth is cuspidate and the molars are cuspidate with three rows of columnar cusps.

Bush rats usually live individually or in groups and are active in the early morning and evening, causing great damage to the crops by eating buds and other parts of plants and other agricultural products. They build their nests on the ground or in dense grass (CORBET, HILL 1992, NOWAK 1999). This species has a wide distribution range and is reported from Iran, The Punjab (India), Western Pakistan, Nepal, and Sri Lanka (MOLUR, NAMEER 2008). It is listed as Least Concern (LC) by IUCN, the International

Union for Conservation of Nature (2008). *G. ellioti* was reported from several protected areas in South Asia (MOLUR *et al.* 2005). It is a partially diurnal species and one which is particularly gregarious, and herbivorous (ROBERTS 1997). It is found in varied habitat conditions including tropical dry deciduous, tropical thorn forests and grassy clumps, but may also venture in to cultivated lands, bushes and orchards. *G. ellioti* has been found to inhabit rocky and hilly tracts, burrows, grassland close to streams, build nests on thick bush and shrubs (MOLUR *et al.* 2005). CORBET, HILL (1992) stated that this species can be considered as a serious agricultural pest species. Iran constitutes a large part of the Iranian plateau. It covers an area of 1 623 779 km² which is located between the Eastern Mediterranean area and the Oriental region, and contains elements of different fauna so the diverse topography and climate of Iran makes the country suitable for taxonomic studies. Kerman province is situated on Southeastern Iran and is the largest province of Iran (11.15% of whole country). This region is the place in which Zagros Mountains, Central Mountains and lowland deserts meet. Kerman is located next to Loot Desert which is one of the hottest zones of Iran and the world. However, the presence of mountains including Kouhbanan (3775 m), Jaftan (3975 m) and Polvar (4233 m) at the margin of the desert moderates its destroying effects on the fauna and flora of the region. Extension of Zagros and central mountains has divided this place into two distinct sections, dry deserts and temperate valleys which meet together to form three zones: desert and marginal desert, tropical zones and temperate mountain zones, therefore, it is among these rare regions possessing a variety of climates where one would expect greatest variation amongst environmental forms. The eurytomid fauna of Southeastern Iran is still poorly known. The same situation seems to be true for other families of Rodentia too, where new records and new species have been recently added to the faunistic inventory in other parts of Iran (TARAHOMI, DARVISH 1999, DARVISH *et al.* 2006a, b, DARVISH *et al.* 2008, KRYŠTUFEK, HUTTERER 2006). LAY (1967) published a list of 126 mammal species of Iran together with their localities, habitats and their systematic status. ETEMAD (1978) provided an identification key for Iranian rodents together with their distribution map. The last published work of mammalian fauna of Iran was provided by KARAMI

et al. (2008) who presented a checklist containing 193 species from different parts of Iran from which rodents constitute 73 species. ZIAIE (1996) provided a field guide to mammals of Iran. There is little published information in English on the rodents of Southeastern Iran and there is no clear knowledge of the number of species and their systematic status in this region. To date no information on morphological and biological characteristics of *G. ellioti* in Southeast Iran is published. The presence of *G. ellioti* in South of Kerman Province in Southeastern Iran is interesting and this indicates that this species has extended its distribution from the Indian subcontinent much farther to the west. The purpose of this study is to determine some morphological and biological characteristics of *G. ellioti* in Kerman Province, Southeastern Iran. The information gained from this study can be used for efficient biological control programmes.

Materials and Methods

Field work was carried out in August 2010 and the specimens were captured in various places among rocks adjacent to citrus orchards in several localities in South of Kerman Province located in Southeast Iran. Totally 20 live traps (locally made traps) were set randomly among rocks adjacent to citrus orchards. The traps were placed at a distance of 6 m apart (CUNNINGHAM, MOORS 1987). These traps were laid at evening time, before sunset and checked next morning. Different baits were used such as puffy snacks, dates, oil bread and cucumber (DEBLASE, MARTIN 1975, RUSSELL 2003, MADJZADEH 1992). Specimens were separated to the mature and immature age groups based on their external sexual characteristics, and only the mature ones were counted in the statistical analysis (MORADI, KIVANÇ 2003). Specimens were collected from four localities, Jabalbarez, Anbarabad, Zarchin, and Rezaabad (Fig. 1).

Four standard external measurements (in mm) were taken: head and body length (HBL); tail length (TL); hind foot length (HFL) and ear length (EL). Fifteen cranial measurements (in mm) were used including: occipitonasal length (OL); condylobasal length (CL): from the occipital condyles to the anterior edge of incisor; zygomatic width (ZW); least interorbital width (interorbital constriction) (LW); cranial width (CW); length of the nasals (LN); length of diastema (LD); length of anterior palatine forami-

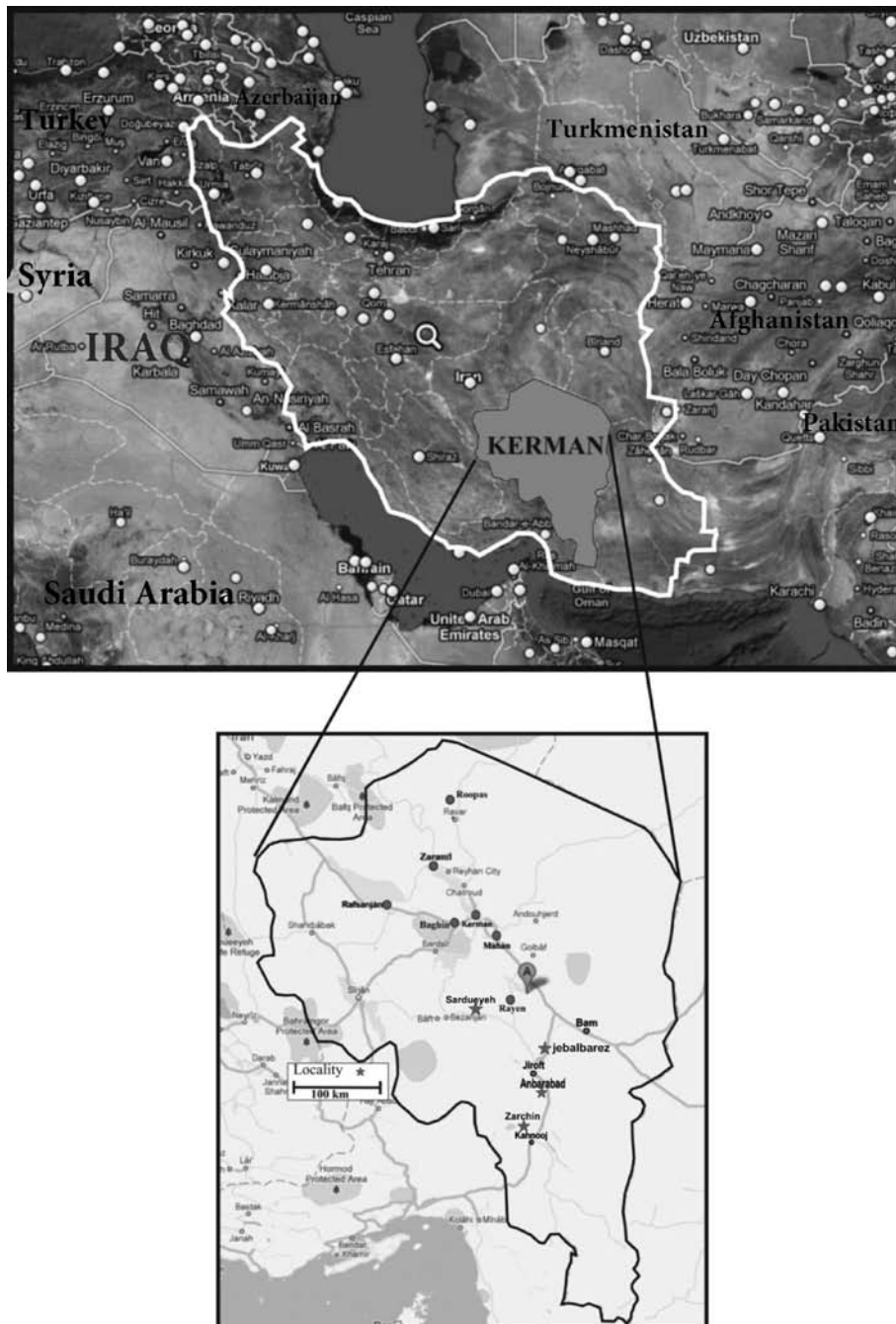


Fig. 1. Map of the study area. The main collecting sites are given.

na (LPF); length of tympanic bullae (LTB); width of tympanic bullae (WTB); length of upper cheek teeth (UCH); length of lower cheek teeth (LCH); width of rostrum (WR); length of mandible (LM); auditory meatus diameter (AMD) (Fig. 2). All measurements were made using digital Calipers accurate to 0.05 mm. The specimens were prepared as conventional museum type (skull). The samples are deposited in the Biology Department, Faculty of Sciences, Shahid Bahonar University of Kerman, Iran.

Results and discussion

In the present study eight specimens of *G. ellioti* were collected from four localities in Jiroft County in Kerman Province, Southeast Iran. Of these, two specimens were immature and so were deleted from the analysis. All mature specimens were female.

Golunda ellioti GRAY, 1837

Type locality: India, Dharwar

Material examined: Iran: Kerman Province,

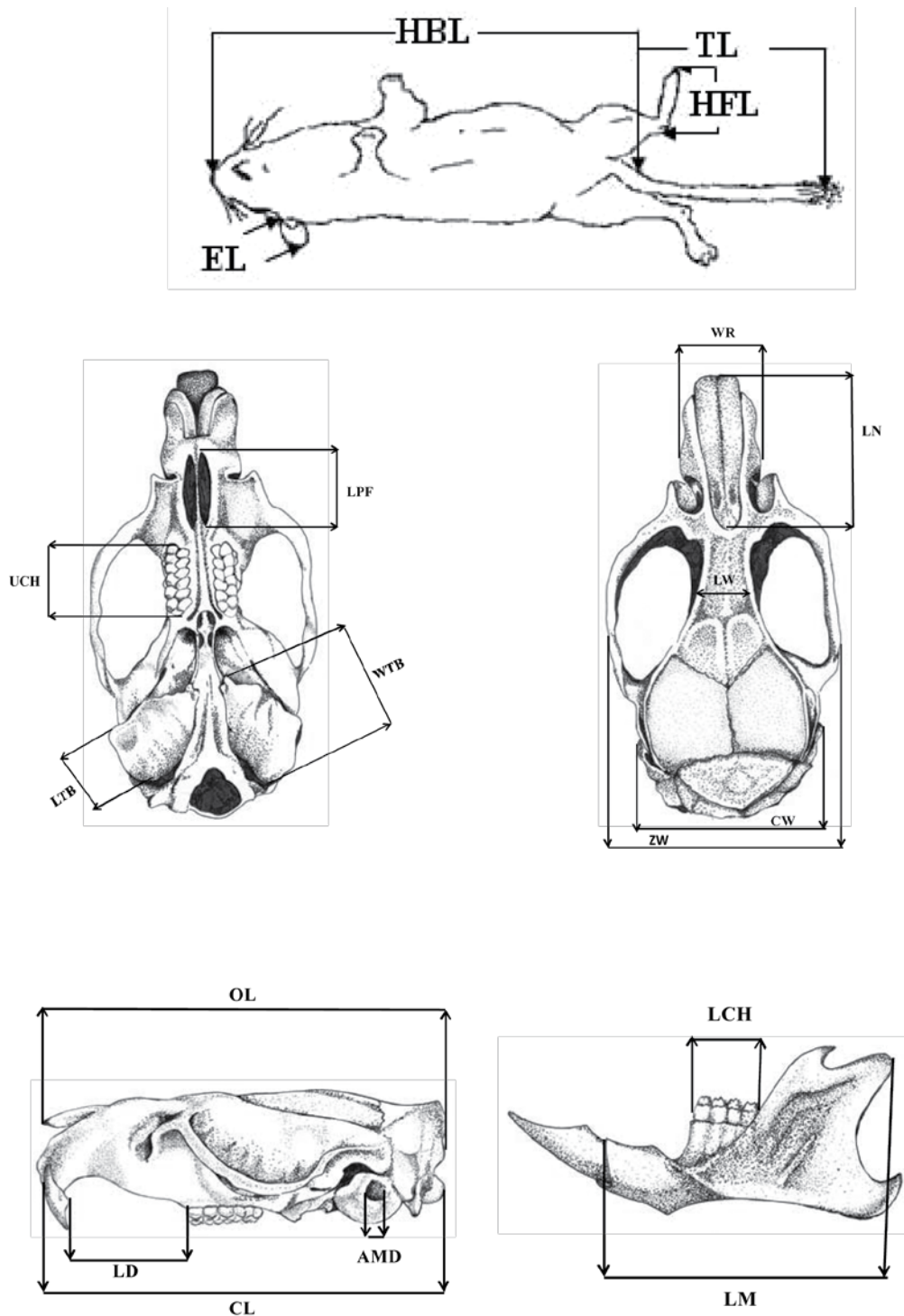


Fig. 2. Drawings and measurements of external and cranial morphometric characteristics of *Golunda ellioti* collected in Kerman Province, Southeastern Iran (original). See text for abbreviations.

Jabalbareh, North Eastern Jiroft city. N 28° 08.1', E 57° 55.2', 1764 m, 05.VIII.2010 (S. M. Madjzadeh), 2♀; Iran: Kerman Province, Anbarabad, South Eastern Jiroft city. N 28° 57.7', E 57° 58.1', 630 m, 11.VIII.2010 (S. M. Madjzadeh), 1♀; Iran: Kerman Province, Zarchin, North Eastern Kahnooj city. N 28° 27.0', E 57° 39.0', 773 m, 21.VIII.2010, (S. M.

Madjzadeh), 2♀; Iran: Kerman Province, Rezaabad, South of Kahnooj city. N 27° 53.4', E 57° 04.9', 581 m, 27.VIII.2010 (S. M. Madjzadeh), 1♀.

External and cranial characteristics: Head and body length 69-140 mm (mean: 124.50). Tail length 54-117 mm (mean: 87.33). The tail has more hairs in comparison to other rats and is gen-

Table 1. Morphometric characters used for *Golunda ellioti* specimens from Kerman Province, Southeastern Iran. Measurements are in mm. See text for abbreviations.

Character	N	Mean	SD	Min	Max
HBL	6	124.50	27.34	69.00	140.00
TL	6	87.33	24.45	54.00	117.00
HFL	6	26.08	3.11	20.00	28.00
EL	6	15.92	2.46	11.50	18.00
OL	6	30.03	4.01	22.01	32.87
CL	6	10.49	2.14	6.33	12.16
ZW	6	15.34	2.22	10.90	16.86
LW	6	4.39	0.23	4.00	4.62
CW	6	11.53	0.79	10.30	12.44
LN	6	3.73	0.22	3.47	4.00
LD	6	7.49	1.37	4.73	8.35
LPF	6	5.23	0.80	3.80	6.25
LTB	6	5.66	0.56	4.61	6.15
WTB	6	4.26	0.77	3.08	5.30
UCH	6	6.30	0.46	5.40	6.62
LCH	6	5.87	0.19	5.67	6.11
WR	6	7.86	0.53	6.85	8.36
LM	6	17.13	2.46	12.13	18.55
AMD	6	2.28	0.22	1.86	2.48

erally shorter than the head and body length. The tail is bi-coloured, dark brownish on the dorsal and yellowish-grey on the ventral. Ear length 11.50-18 mm (mean: 15.92). The ears covered with hairs and circular. Hind foot length 20-28 mm (mean: 26.08). The dorsal part of body is grayish-brown or fairly dark yellowish-brown to grayish-brown and the tips of hairs are black. The ventral fur is whitish. The sole of the hind foot is blackish. Females have eight mammae. Cheek teeth are strongly cuspidate with three rows of cusps. Incisors are reddish and grooved. The external and cranial measurements are shown in Table 1.

Habitat and biology: *Golunda ellioti* was found at altitudes between 581-1764 m a.s.l in the study area. They were observed to have lived among rocks adjacent to scattered citrus orchards. In the study area, *Meriones hurriana* JORDON, 1867 was also encountered. The Indian bush rat rarely burrows, prefers to shelter among rocks and locates its nest on the ground or usually in dense grass. In the study area they frequently were found actively feeding in the middle of day but it seems that during cold seasons they do not emerge above ground. They usually feed on seeds, young shoots, grass stems as well

as other vegetable materials. In the study area it was found that it feeds on citrus. There is no information on their reproduction. Apparently the usual number of young is three or four and they breed mainly in the spring and summer in the study area.

Golunda ellioti was not reported from Iran by LAY (1967). ROBERTS (1977) mentioned the following measurements of 27 specimens from Sind and the Punjab (Pakistan) as follows: head and body length average 126 mm (range 114-155); tail averaging 109 mm (range 93-125 mm); hind feet averaging 26 mm (range 24-28 mm); ear averaging 18 mm (range 15-19 mm). NOWAK (1999) stated that in this species the tail length is usually between 82% to 87% of the head and body length. ROBERTS (1977) based on the above measurements of Bush rat from Pakistan concluded that the tail length is about 86% of the head and body length which is in accordance with NOWAK (1999). The result of the present study showed that in Iranian specimens, the tail length is 70% of the head and body length which is less than in Pakistan specimens. The average length of the head and body is relatively the same as in Pakistan and Iranian specimens but it seems that the Pakistan specimens have a longer tail in comparison to Iranian specimens. The hind feet length of Iranian and Pakistan specimens is the same, but Iranian specimens have a little smaller ear in comparison to Pakistan specimens. Studies have shown that Bush rats are nocturnal in the areas where the population density is higher. They feed at dusk but in regions with the densest vegetation, they are active during the daytime (ROBERTS 1977). In the present study, the Bush rats also were observed emerging to forage during the daytime which indicates their similar activities in Pakistan and Iran. In the study area this species was captured among rocks adjacent to citrus orchards from 581 to 1764 m. However the present study was a preliminary investigation on *G. ellioti* in Iran and showed that there are some variations among populations of this species in Iran and Pakistan. Sufficient samples from its distribution range in the study area and other countries are needed in order to investigate completely intraspecific variation in this species.

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