

A Biological Study of the Little Earth Hare, *Pygeretmus pumilio* (Kerr, 1792), In the Golestan Province of Iran (Mammalia: Rodentia: Dipodidae)

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Abstract

Order Rodentia has 6 families, 32 genera and 79 species in Iran. Among them the family dipodidae are with 4 genera and 10 species. Twenty seven specimens of Little Earth Hare, *Pygeretmus pumilio* were caught from a sampling site at near of Voshemgir dam and around of fishery culture in the northeast of Aghghala city of Golestan province in 2001-2002. The results are as follows: head and body 72.96-94.66 (mean 85.41) mm; tail 114.20-148.80 (mean 134.33) mm; hind foot 41.62-46.74 (mean 44.38) mm; ear 18.43-24.60 (mean 21.22) mm; claw of the largest toe 1.69-2.67 (mean 2.03) mm; weight 22.54-46.60 (mean 35.05) gr. The biometry of skulls were also measured. Teeth formula is $i\ 1/1, c\ 0/0, p\ 0/0, m\ 3/3$. We observed 2 times birth of pups. One time (31/4/2002) four pups were born. Weight of mother was 38.75 gr. The pups are pinkish, without hairs and with closed eyes and short ears. Weight of pups were 2.22-2.37 (mean 2.29) gr. The other four pups (1/3/2002) were lighter and their weight were 1.60-1.68 (mean 1.63) gr. This species also feeds on desert plant, melon and water melon.

Keywords: Little earth hare; *Pygeretmus pumilio*; Iran; Middle East

Abbreviation: W: Weight; HBL: Head and Body Length; TL: Tail Length; HFL: Hind Foot Length; EL: Ear Length; LN: Length of Nail; LM: Length of Mustache; APF: Anterior Palatine Foramina; PL: Palatal Length; PBL: Palatine-Basioccipital; D: Length of Diastema; ZPL: Zygomatic Page Length; CAV: Distance Between Lower First Molars to Angular Process; AAV: Distance Between Lower First Molar to Notch Between Angular and Articular Process; ARTL: Distance Between Lower First Molar to Articular Process; ZIGW: Zygomatic Width; IOL: Interorbital Length; CW: Cranial Width, IW: Upper Incisor Teeth Width; CHEKW: Distance of Upper Teeth Rows; BW: Bullae Width; BL: Bullae Length; DH: Depth of Skull; ZAL: Zygomatic Arc Length; CBL: Condylbasal Length; LM1U: Length of First Upper Molar; LM2U: Length of Second Upper Molar; LM3U: Length of Third Upper Molar; WM1U: Width of First Upper Molar; WM2U: Width of Second Upper Molar; WM3U: Width of Third Upper Molar; LM1L: Length of First Lower Molar; LM2L: Length of Second Lower Molar; LM3L: Length of Third Lower Molar; WM1L: Width of First Lower Molar; WM2L: Width of Second Lower Molar; WM3L: Width of Third Lower Molar

Introduction

Rodentia is the largest order of mammals encompassing at least 43% of recognized mammalian species with around 2277 species worldwide [1,2]. They are generally considered as pests due to the economic losses caused to agriculture and their potential to spread disease [1].

Early attempts to document Iranian mammals date back to the 18th century and coincide with the classical works by [3]. More than 79 rodent species have been recorded from Iran up to present. Rodents are the most diverse order of mammals in Iran (38.2% of species) [2].

Family Dipodidae includes the jerboas (strongly saltatorial), jumping mice (moderately saltatorial) and the birch mice (nonsaltatorial). Jerboas occur in arid and semiarid areas in northern Africa, Arabia, and Asia Minor and in southern Russia eastward to Mongolia and northeastern China. Jerboas have a compact body, large head, reduced forelimbs, and elongate hind limbs, features associated with saltatorial locomotion. The tail is long and usually tufted [4-6]. The rostrum is usually short, the orbits are large, and through the enlarged infraorbital canal passes most of the anterior part of the medial

masseter, which originates largely on the side of the rostrum. The hind limbs are elongate in all genera. Jerboas occupy arid area and hibernate during the winter in fairly deep burrows. Locomotion in jerboas is chiefly bipedal, but when they are moving slowly, the forefeet may be used to some extent. When frightened, jerboas move rapidly in a series of long leaps, each of which may cover 3 meters [4]. Dipodids feeds on seeds, the succulent parts of plants and insects [5,6]. They do not require free water in nature and sometimes don't use water in captivity either when available. Jerboas have a strong visual, hearing and smell senses [6,7], nevertheless are a good prey for carnivores particularly foxes, cats, owls and snakes. They live well in captivity and some of them are kept as a pet [6].

The Little earth hare, *Pygeretmus pumilio* that called Dwarf fat-tailed jerboa in the past belongs to the Dipodidae is a medium-sized five-toed jerboa that is widespread throughout the Middle East, where it is distributed from the Don River through Kazakhstan to the Irtysh river, NE Iran, E to S Mongolia, China [6]. In Iran the species is widely distributed in Golestan province [8]. *P. pumilio* appears associated with succulent vegetation, mostly represented by species of the family Chenopodiaceae. The structure of the teeth and digestive tract also characterize this species as primarily herbivorous, though less specialized in this respect than other representatives of the genus *Pygeretmus*. *P. pumilio* is one of the most productive with females bearing two or three litters with 2-5 pups per litter in a year, depending on abundance of food and length of the summer period. Young animals from the first spring become adult by the middle of summer and

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can breed, but participation of females in second and third waves of breeding and maturation of the offspring may be restricted by scarcity of food [9].

There are only 2 specimens' characters of Kazakhstan in Mammals of Iran [10] and 1 specimen of Turkmen steppes in northern Golestan province [8]. So, there is not enough information on the geographic distribution and biology of *P. pumilio* in Iran. The purpose of this study is to determine some morphological, biological and geographic characteristics of *P. pumilio* in Golestan Province, northeastern Iran.

Material and Methods

Study area

Iran comprises a variety of geographic and climatic habitats. It is located in the Palearctic region and forms a bridge between the Middle East and Indian subcontinents. It is also the crossroads between three major faunal regions, the Palearctic, Ethiopian, and Oriental. Golestan province is located in northeastern Iran, southeast of the Caspian Sea, a region thought to be one of the most important refuge areas during glacial periods [8].

27 specimens of *P. pumilio* (22 male and 5 female) were caught by Sachok net at night in 2001-2002. Sampling site is located near Voshemgir dam and around of fishery culture in the northeast of Aghghala city in Golestan province (Figure 1). All specimens kept in laboratory and then studied. Six standard external characters, 18 cranial variables and dental characters of each specimen were measured. All measurements were made using digital Calipers accurate to 0.05 mm. The specimens were prepared as conventional museum type (skull). Vouchers specimens were deposited in the Zoology Museum of Golestan University (ZMGU).

Results

Family dipodidae

Pygeretmus pumilio

Brief description

The front foots are short and used for walking slowly but hind foots are long and used for leap and have 5 fingers, the 3 middle finger has grown and two lateral fingers don't place on the ground when standing on two feet. The plantar surface is hairless. It has long ears that don't reach the snout if bent, a short snout with long mustaches, large black

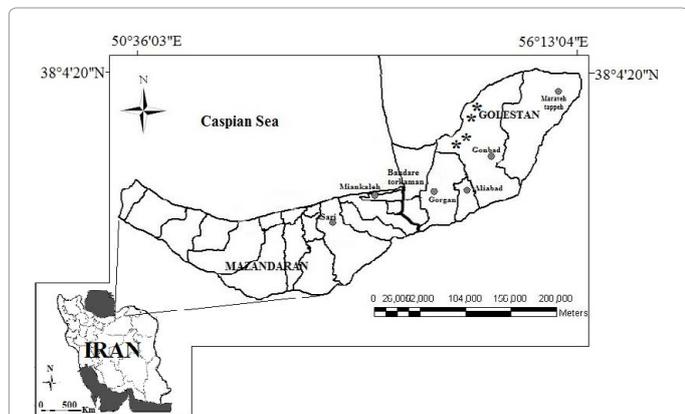


Figure 1: Map of sampling location of the *P. pumilio* in the Golestan province, Iran.



Figure 2: *P. pumilio* in the Golestan province, Iran, ZMGU.396 (photo by H.G.Kami).



Figure 3: A. Ventral, B. Dorsal and C. Lateral views of the skull of *P. pumilio* in the Golestan province, Iran, (ZMGU. 148) (photo by R.Yadollahvand).

Character	N	Minimum	Maximum	Mean	Std. Deviation
HBL	27	72.96	94.66	85.41	6.54
TL	27	114.20	148.80	134.33	9.67
HFL	27	41.62	46.74	44.38	1.35
EL	27	18.34	24.60	21.22	1.38
LN	27	1.69	2.67	2.03	0.25
LM	27	54.27	73.46	65.33	4.24
W	27	22.54	46.60	35.05	7.91

Table 1: Standard external measurements in *P. pumilio*.

eyes and females have 4 pairs of nipples (Figure 2). Incisors lack groove and extend forward, each half of the jaw has three molars and there is no premolars and empty space called diastema exists between the incisors and molars (Figure 3). It has a thick and long tails. Tuft of tail end is mostly black with white tip and then up to the base is light brown. Its coloration is dark gray to light brown behind the ears. Back body hair is a yellowish buff color come with black, flanks and face is brighter and ventral surface is white (Figure 2).

Measurements

In *P. pumilio* head and body length (HBL) of the largest female (ZMGU. 145) and the largest male (ZMGU. 142) were 94.18 mm and 94.66 mm respectively. In the smallest male (ZMGU. 138) and the smallest female (ZMGU. 153), HBL were 72.96 mm and 84.78 mm respectively. Tables 1 and 2 shows the descriptive statistics and the summarized measurements of the morphometric characters of the specimens.

There are significant differences in character EL between males and females, but in the other characters have not significant difference. Table 3 shows the results of the t-test ($p < 0.05$).

Reproduction

Two females reproduced in laboratory in March 30th 2001 and March 1th 2002 and 4 pups were born in both time. Weight of the first

Character	N	Minimum	Maximum	Mean	Std. Deviation
LM1U	27	1.60	1.96	1.80	0.13
LM2U	27	1.54	1.72	1.61	0.07
LM3U	27	0.84	1.20	1.04	0.11
WM1U	27	1.20	1.64	1.42	0.17
WM2U	27	1.24	1.76	1.41	0.18
WM3U	27	1.00	1.40	1.13	0.13
LM1I	27	1.86	2.26	2.14	0.13
LM2I	27	1.68	2.00	1.81	0.10
LM3I	27	1.10	1.54	1.32	0.14
WM1I	27	1.18	1.50	1.36	0.12
WM2I	27	1.20	1.60	1.43	0.14
WM3I	27	1.00	1.36	1.18	0.14
APF	27	4.80	7.48	5.40	0.81
PL	27	5.70	6.42	5.93	0.22
PBL	27	6.12	7.46	6.78	0.47
CHCKPL	27	5.30	6.90	5.82	0.64
D	27	7.70	8.28	7.99	0.20
ZPL	27	4.26	5.68	4.92	0.46
CAV	27	5.76	7.20	6.52	0.40
AAV	27	9.82	10.64	10.13	0.30
ARTL	27	10.58	11.86	11.29	0.33
ZIGW	27	18.06	20.90	19.86	0.75
IOL	27	7.48	8.10	7.74	0.19
CW	27	11.92	15.14	13.09	1.05
IW	27	1.44	2.66	1.73	0.44
CHEKW	27	2.36	2.76	2.50	0.15
BW	27	3.08	4.40	3.83	0.38
BL	27	5.32	5.94	5.55	0.19
DH	27	10.70	12.02	11.38	0.41
ZAL	27	9.80	11.22	10.56	0.44
CBL	27	22.54	25.54	23.83	0.88

Table 2: Standard cranial and dental measurements in *P. pumilio*.

Characters	Sex	N	Mean	Std. Deviation	Sig(2-tailed)
HBL	♂	22	84.69	6.90	0.09
	♀	5	88.60	3.58	
TL	♂	22	134.23	9.52	0.91
	♀	5	134.74	11.47	
HFL	♂	22	44.36	1.46	0.88
	♀	5	44.47	0.80	
EL	♂	22	20.92	1.19	0.01
	♀	5	22.54	1.54	
LN	♂	22	2.03	0.26	0.73
	♀	5	2.08	0.27	
LM	♂	22	65.34	4.48	0.96
	♀	5	65.23	3.03	
W	♂	22	33.74	7.54	0.09
	♀	5	42.04	4.13	

Table 3: Morphological measurements in *P. pumilio*

group were 2.22-2.37 (mean 2.29) gr and of the second group were 1.60-1.68 (mean 1.36) gr. The pups were born in 15-20 minutes after the previous ones. The females have a definite voice in reproduction time. After litter the mean weight of females were 38.75 gr. Mother avoids the giving milk to pups in captivity and all of them died. The female ate its placenta after parturition as soon as possible. Head and body length of 8 pups were 28.90-33.90 (mean 33.10) mm; tail length and tarsus length were 9.8-13 (mean 10.7) mm and 6.7-7.6 (mean 7.4) mm, respectively. Pups are light pinkish in color, and their eyes closed. Their skin is hairless. Ear is rudimentary and impossible for measurement. The claws of pups are seen clearly (Figure 4).

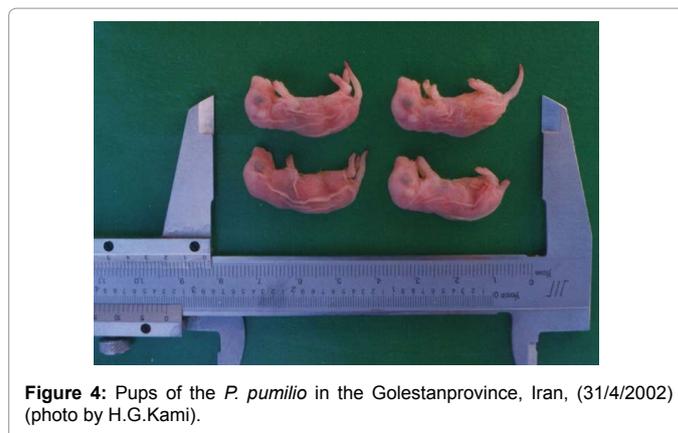


Figure 4: Pups of the *P. pumilio* in the Golestan province, Iran, (31/4/2002) (photo by H.G.Kami).

Sex ratio

Based on presence of breast in female sexes were detected. Of 27 specimens of *P. pumilio*, 22 specimens were males, 5 specimens were females and sexual ratio (male/female) was more than 4:1.

Habitat

P. pumilio occurs in open areas, along north part of Golestan province, near Turkmenistan border that is mostly desert and semi-desert. The nest has a long hole and there is no embankment around it. There are two type of nest, permanent and temporary. During the day the nest opening is closed with the soil to maintain security, moisture and heat nest.

Diet

P. pumilio is herbivorous. Succulents that grow throughout the summer become the main food for *P. pumilio* during the dry and hot season when other desert rodents feed on more seeds and insects. In the laboratory they fed on bread, cookie, melon, watermelon and cheese. They hold food with their hands and eat slowly.

Activity and behavior

Locomotion in *P. pumilio* is chiefly bipedal, but when they are moving slowly, the forefeet may be used to some extent. When frightened, *P. pumilio* move rapidly in a series of long leaps and use the tail as a fulcrum. When sleeping, put their head between the hind legs and near the Earth. Stand on two feet and clean the snout with frontal small feet. They are completely asleep during the day and are active at night and hibernate during the winter in fairly deep burrows and usually have solitary life.

Unlike the other jerboas, the leap is not too height. During the leap, keeps the head down and do not bring up the head in the pause between two leaps.

Discussion

Rodents are accustomed to different conditions in nature and exist in most parts of the earth [10]. Rodents have high potential for reproduction, although they have many enemies in nature and many of them are killed by several factors. Reproduction depends on the weather, specially the annual rainfall [6]. Some of them reproduce five or six times a year. The number of pups is always very high. It was seen 4 to 17 pups in one pregnant female of some species. On the other hand, the growth rate of pups is very quick, and some of them become matured in two months and reproduced successfully and approximately have

a high lifetime up to 6 years [6]. Thus if biological conditions become suitable, especially climatic and food ones, the rodents increase in number extremely. If these suitable conditions continue several years, the population of them becomes overflow. At this time, rodents act as dangerous pests for agricultural products. Despite the damages cause to the human and agricultural production, rodents are important in maintaining the balance of nature [10]. In general, rodents have two incisor teeth in the upper and lower jaw that is different in each family and species, and is used to family identification [11].

Northeastern Iran is a point of overlap among ranges of species with extreme variation in the regional topography and penetration of species from other regions. It is an area of contact between two cradles of endemism, northeastern Iran and southern Turkmenistan [12]. The Turkmen steppes in northern Golestan Province are a continuation of the Turkmenistan desert and are home to semi-desert species such as small five-toed jerboa, *Allactaga elater* and great gerbil, *Rhombomys opimus*. Despite the fact that the Koppe Dagh Mountains form a barrier between Iran and Turkmenistan, *P. pumilio* has entered this region [8]. *P. pumilio* is a defenseless rodent and has many enemies in nature that live in underground and are active at night, to protect them from predators [10]. As these species feed on desert plants, water melon and some insects, thus the role of these are considerable in agriculture and the control of some insects.

According to the results of this study, the population of *P. pumilio* in this area, is identical with specimens of Kazakhstan in terms of morphological and morphometric characteristics [8,10]. It also confirms the results of previous study in this area [8]. In addition, due to the lack of information about this species in Iran, the current study is the first one conducted about population, reproduction and distribution of this species. Due to importance and role of these species in the maintenance and control of the balance of nature, the study of these species were necessary that this study could be a prelude to more comprehensive research in the future on this and other rodent species in Iran.

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