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## COMMUNICATION

### ANNOTATED CHECKLIST AND CONSERVATION STATUS OF MAMMALS OF FARS PROVINCE, SOUTHERN IRAN

Fatah Zarei, Sasan Kafaei & Hamid Reza Esmaeili

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## ANNOTATED CHECKLIST AND CONSERVATION STATUS OF MAMMALS OF FARS PROVINCE, SOUTHERN IRAN

Fatah Zarei<sup>1</sup> , Sasan Kafaei<sup>2</sup>  & Hamid Reza Esmaili<sup>3</sup> 

<sup>1,3</sup> Zoology Section, Department of Biology, College of Sciences, Shiraz University, Shiraz 71454, Iran

<sup>2</sup> Head of Research and Technology Bureau, Department of Environment, Shiraz 71346, Iran

<sup>1</sup> fataahzare@gmail.com, <sup>2</sup> sasankafaei@gmail.com, <sup>3</sup> hresmaeili@shirazu.ac.ir (corresponding author)

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**Abstract:** Our purpose in this study was to gather all previously published data and our own data of extensive field expeditions and camera trapping to present a general view of the Fars mammals. The mammals of Fars Province, southern Iran, comprise of 72 species in 53 genera, 28 families and seven orders. The most diverse order is Chiroptera with 23 species or 31.9% of the mammalian fauna, followed by Carnivora and Rodentia (each with 18 species, 25%). The most diverse family is Vespertilionidae with nine species or 12.5% of the mammalian fauna, followed by Rhinopomatidae and Muridae, each with eight species or 11.1% of the mammalian fauna, Felidae and Canidae (each with five species, 6.9%), respectively. Sixteen families have only one species each. The Fars Province is the type locality of *Trienops persicus* Dobson, 1871, *Eptesicus serotinus shiraziensis* (Dobson, 1871), *Microtus irani* Thomas, 1921, and *Apodemus witherbyi* (Thomas, 1902). Five species are listed in the Appendix I, eight species in the Appendix II, and eight species in the Appendix III of the Convention on International Trade in Endangered Species (CITES). In addition, three species are considered as endangered and nine species as protected species based on the rules and regulations/laws of the Iranian Department of the Environment (DOE). The Asiatic Lion *Panthera leo persica* Meyer, 1826 is extirpated in Iran. Among the reported species, 60 species (83.3%) are considered as Least Concern (LC), two species as Not Evaluated (2.7%), one species as Data Deficient (1.4%), six species (8.3%) as Vulnerable (VU), and three species (4.2%) as Near Threatened (NT) in the IUCN Red List of Threatened Species. The current checklist shows that the mammalian fauna of Fars Province is rich and taxonomically diverse, and the provided information will be necessary for the development of competent and pragmatic management plans and effective conservation policies.

**Keywords:** Conservation, distribution, Iran, mammalian fauna, taxonomy.

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**Author Details:** FATAH ZAREI is a PhD student of Systematic Zoology at Shiraz University. The general area of his interest is Molecular Ecology and Phylogeography. DR. SASAN KAFAEI is a wildlife expert and currently, head of Research and Technology Bureau at Department of Environment, Fars Province. DR. HAMID REZA ESMAILI is a Professor of Zoology at Shiraz University, head of Zoological Museum of Shiraz University (ZM-CBSU), member of the Iranian Society of Ichthyology, and chief editor of the Iranian Journal of Ichthyology.

**Author Contribution:** SK collected the specimens and prepared the photos; FZ, HRE, and SK prepared, reviewed, analyzed, and approved the manuscript.

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## INTRODUCTION

The information provided in checklists is necessary for the development of competent and pragmatic management plans and effective conservation policies (Esmaeili et al. 2017). Biodiversity conservation, biogeography, and evolutionary history influence faunal composition. This is also true when postulating inter-realms communication routes and dispersal barriers (Lomolino et al. 2006). Faunal composition data, when coupled with geographical, physiographic, and climatological information, can inform hypotheses on the processes of diversification and endemism (Darvish et al. 2014). Faunal documentation is also relevant to public health management (Stenseth et al. 2003), especially in the case of mammals which are considered as pests (Schiller et al. 1999) and reservoirs of zoonotic diseases (Nateghpour et al. 2013).

Zoogeographically, Iran is an interesting country, as much of its area is located in the Western Palearctic, but southern parts are affected by the Indomalayan and Afrotropical elements. Thus, diversity in the mammalian fauna of Iran is such that it can be considered as a collection of European, African, Asian, and Iranian species (Ziaie 1996).

Situated in southern Iran, the Fars Province is the fourth largest province of the country. Besides its idiosyncratic zoogeographic position, a wide range of geographic and physiographic conditions, coupled with climatologically diverse environments in this province, have provided enormous diversity (Esmaeili & Teimori 2017). Among vertebrates, the herpetofauna (Gholamifard et al. 2012) and ichthyofauna (Esmaeili & Teimori 2017) of Fars Province have been well-studied and received more attention. So far, no comprehensive faunistic study has been published on the mammalian fauna of Fars Province. Herein, we present an up-to-date checklist of its mammalian species with notes on their taxonomy and conservation status.

## MATERIALS AND METHODS

**Study Area:** This checklist focuses on the mammals of Fars Province which lies between 27°N and 31°N and 50°E and 55°E in southern Iran and covers a total area of about 1,22,608 km<sup>2</sup> (7.4% of the total area of Iran). The map of the study area (Fig. 1) has been created using Global Mapper 18 (Global Mapper Software, LLC, Olathe, Kansas) and Surfer 11 (Golden Software, LLC). The elevation of Fars Province ranges from 450m in

the south to about 4,050m in the north, with a mean of 1,491m. The mean annual precipitation ranges from 150mm to 1,200mm (Gholamifard et al. 2012).

Fars Province possesses three national parks (Bamou, Bakhtegan, and Qatruiyeh), one wildlife refuge (Bakhtegan), eight protected areas (Arzhan and Parishan, Mianjangan, Hormood, Bahram-e Goor, Meleh Galeh, Tang-e Bostanak, Margoon, and Baghe Shadi), minor parts of two other protected areas (Dena and Tarom) and 17 non-hunting areas (Fig. 1). Recommended areas for promotion to protected status are also the Dareh Bagh, Barm-e Firouz, and Gorm Mountains. Thus, the total area of the listed protected areas (both declared and recommended) in this province is about 12,80,386ha (31.1% of the total area).

Fars Province possesses three main terrestrial ecoregions, including the central Persian desert basins in the north and northeast, the Zagros Mountains forest steppe extending from northwest to the southeast, and the Nubo-Sindian desert and semi-desert ecoregion in the south, as well as numerous aquatic ecoregions including at least 10 lakes and 29 rivers (Olson et al. 2001). A wide range of geographic and geologic conditions coupled with the climatologically diverse environments and consequent habitat types have provided enormous diversity in this part of Iran.

**Study Method:** The data presented in this checklist come from the published scientific reports (e.g., Lay 1967; De Blase 1971, 1972, 1980; De Blase et al. 1973; Etemad 1978, 1985; De Roguin 1988; Harrison & Bates 1991; Ziaie 1996; Firouz 1999; Gutleb & Ziaie 1999; Benda et al. 2006, 2012a; Esmaeili et al. 2008a,b; Ghoddousi et al. 2008a; Karami et al. 2008; Zareian et al. 2012; Karami et al. 2016) and our extensive field expeditions as well as camera-trapping during recent years. Mammals were identified based on morphologic characteristics and descriptions using various field guides (e.g., Etemad 1978, 1985; Ziaie 1996; Karami et al. 2016). Information regarding the type locality follows Karami et al. (2008). Geographic distribution for each species was provided according to available references and provincial divisions map of the country (Fig. 2).

## RESULTS

The total confirmed mammals of Fars Province comprises 72 species in 53 genera, 28 families, and seven orders (Table 1), living in different habitats (Image 1). The most diverse order is Chiroptera (23 species, 31.9%), followed by Carnivora and Rodentia

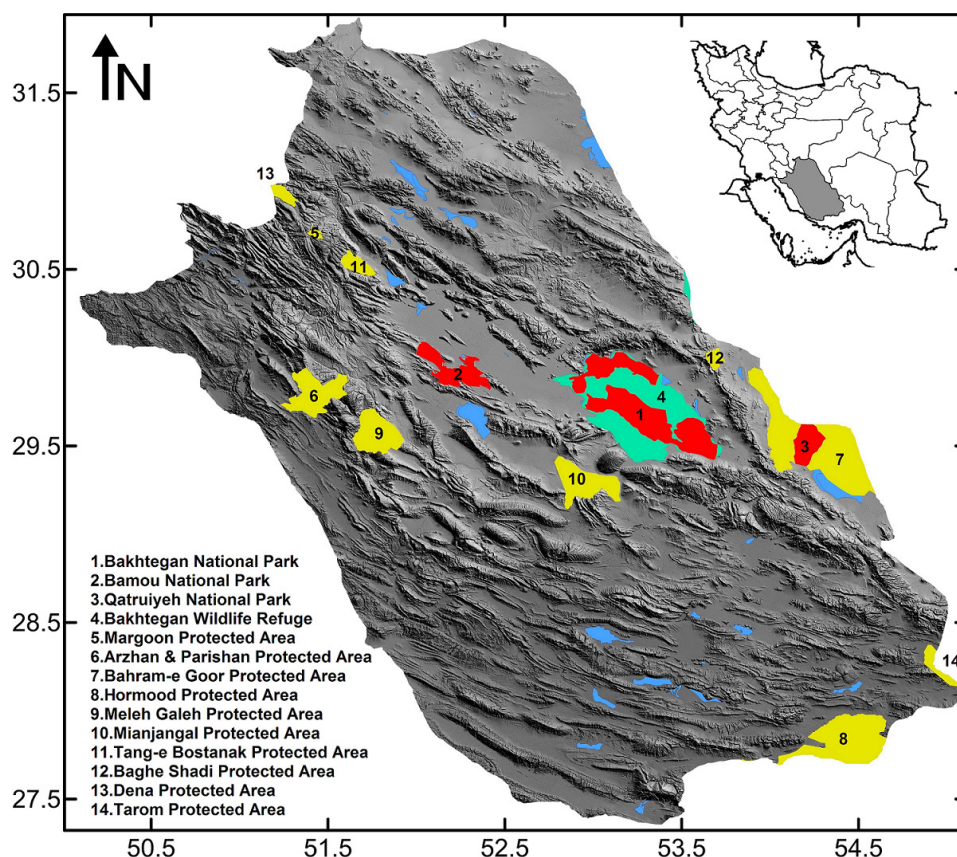


Figure 1. Fars Province, southern Iran showing the area and distribution of the protected areas.

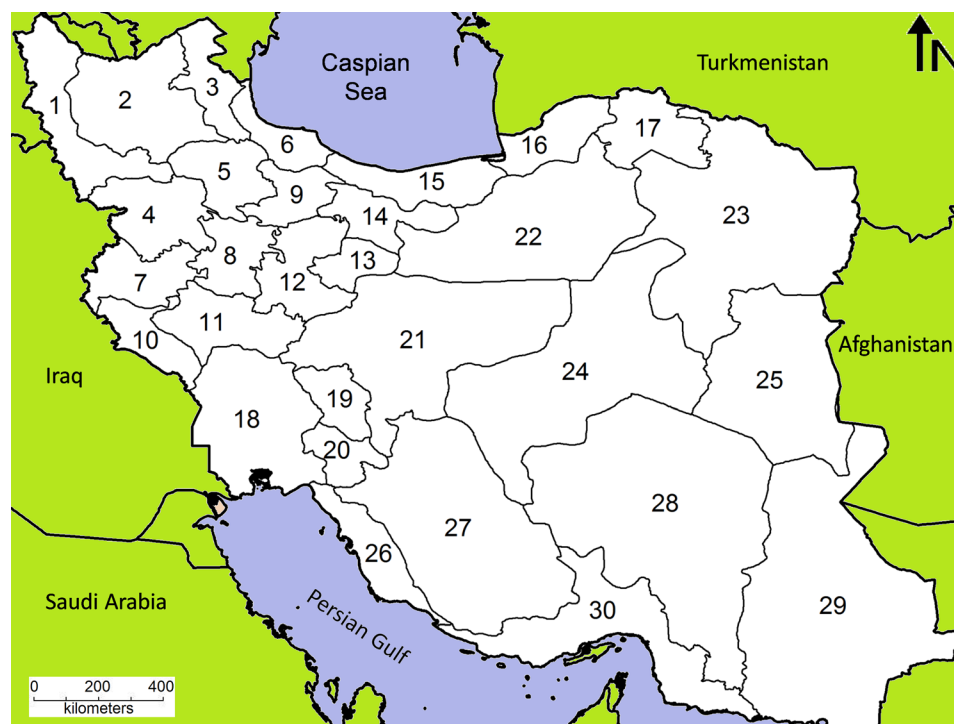


Figure 2. Provinces of Iran. 1 - West Azerbaijan; 2 - East Azerbaijan; 3 - Ardabil; 4 - Kurdistan; 5 - Zanjan; 6 - Gilan; 7 - Kermanshah; 8 - Hamadan; 9 - Qazvin; 10 - Ilam; 11 - Lorestan; 12 - Markazi; 13 - Qom; 14 - Tehran and Alborz; 15 - Mazandaran; 16 - Golestan; 17 - North Khorasan; 18 - Khuzestan; 19 - Chaharmahal and Bakhtiari; 20 - Kohgiluyeh and Boyer-Ahmad; 21 - Isfahan; 22 - Semnan; 23 - Razavi Khorasan; 24 - Yazd; 25 - South Khorasan; 26 - Bushehr; 27 - Fars; 28, Kerman; 29 - Sistan and Baluchestan; 30 - Hormozgan.



**Table 1. Species diversity of mammalian families in Fars Province, southern Iran.**

Order	Family	Genera	Species
Eulipotyphla	Erinaceidae	1	1
	Soricidae	3	3
Chiroptera	Pteropodidae	1	1
	Rhinopomatidae	2	8
	Emballonuridae	1	1
	Hipposideridae	2	2
	Vespertilionidae	5	9
	Miniopteridae	1	1
	Molossidae	1	1
Carnivora	Canidae	2	5
	Felidae	3	5
	Herpestidae	1	2
	Hyaenidae	1	1
	Mustelidae	3	4
	Ursidae	1	1
Perissodactyla	Equidae	1	1
Artiodactyla	Suidae	1	1
	Cervidae	1	1
	Bovidae	3	4
Rodentia	Sciuridae	1	1
	Dipodidae	2	2
	Calomyscidae	1	1
	Cricetidae	4	4
	Muridae	7	8
	Gliridae	1	1
	Hystricidae	1	1
	Ochotonidae	1	1
	Leporidae	1	1

(each with 18 species, 25%). The most diverse family is Vespertilionidae (nine species or 12.5%), followed by Rhinopomatidae and Muridae (each with eight species, 11.1%), Felidae and Canidae (each with five species, 6.9%), respectively. Sixteen families have only one species each. Fars Province is the type locality of *Triadenops persicus* Dobson, 1871, *Eptesicus serotinus shiraziensis* (Dobson, 1871), *Microtus irani* Thomas, 1921, and *Apodemus witherbyi* (Thomas, 1902). Among the reported species, 60 species (83.3%) are considered as Least Concern (LC), two species as Not Evaluated (2.7%), one species as Data Deficient (1.4%), six species (8.3%) as Vulnerable (VU), and three species (4.2%) as Near Threatened (NT) in the IUCN Red List of Threatened Species. Five species are listed in Appendix I, eight



**Image 1. Examples of habitat types in Fars Province. A & B - Arzhan & Parishan Protected Area; C & D - Bamou National Park. © S. Kafaei.**

species in Appendix II and eight species in Appendix III of the Convention on International Trade in Endangered Species (CITES). In addition, three species are considered as endangered and nine species as protected based on the rules and regulations/laws of the Iranian Department of the Environment (DOE). The Asiatic Lion *Panthera leo persica* Meyer, 1826 is extirpated in Iran.

## TAXONOMIC ACCOUNT

### Order Eulipotyphla Waddell, Okada & Hasegawa, 1999

#### Family Erinaceidae Fischer, 1814

##### Genus *Paraechinus* Trouessart, 1879

***Paraechinus hypomelas* (Brandt, 1836)** - Brandt's Hedgehog

Type locality: South Kazakhstan.

Diagnosis: HB 140–270 mm, T 10–40 mm, HF 33–38 mm, S 38 mm and W 400–700 g; ears triangular and longer than the dorsal spines; a bare triangular area between spines on the forehead; body black, with tawny and white forms; face and under parts hairs black in the black forms, spines with black and yellow stripes, but the whole body looks black; ventral area whitish-yellow, and spines tawny with no black coloration in the lighter forms.

Comments: The nominate subspecies is distributed in mainland Iran, but those from the Larak Island, southern Iran, belong to a distinct cluster (Yusefi et al. 2016).

Distribution: Fig. 2 (9, 10, 12, 16, 20, 21, 23, 24, 26, 27, 28, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

#### Family Soricidae Fischer, 1814

##### Genus *Crocidura* Wagler, 1832

***Crocidura suaveolens* (Pallas, 1811)** - Lesser White-toothed Shrew

Type Locality: Russia, Crimea, Khersones, near Sevastopol.

Diagnosis: HB 56–88 mm, T 35–56 mm, HF 10–14 mm and W 4.5–15 g. Tail longer than half of head-body length, relatively thick and gradually tapers off, ending with a tuft of short hairs; eyes small; pinna enlarged; body covered with dense, soft and delicate hairs; dorsal fur variable from light gray to grayish brown; ventral fur orange-yellow.

Comments: The southernmost records in Iran are from localities in Fars (Esmaeili et al. 2008b, Hutterer & Harrison 1988) and Kerman provinces (Dubey et al. 2007). A gene tree revealed two main clades in Iran,

northern vs. central and northwestern (Hadadian-Shad et al. 2017).

Distribution: Fig. 2 (1, 16, 17, 19, 20, 21, 27, 28).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

##### Genus *Suncus* Ehrenberg, 1832

***Suncus etruscus* (Savi, 1822)** - Etruscan Shrew

Type Locality: Italy, Pisa.

Diagnosis: HB 35–48 mm, T 25–30 mm, HF 7–8 mm, and W 1.5–2.5 g. Body small and delicate; snout long, pointed and projects beyond the lower lip, long whiskers observed around it; eyes small; ears long; tail thick at the base and longer than half the head-body length, covered with short hairs with a few long hairs between them; tail end with a tuft of large hairs; fur soft and short, grayish-brown on dorsal and light gray on ventral; feet short.

Comments: One record from the Gorm Mountain, Jahrom, Fars Province, by Esmaeili et al. (2008b) extended its known distribution range in Iran further to the south.

Distribution: Fig. 2 (3, 16, 18, 19, 23, 27, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

##### Genus *Neomys* Kaup, 1829

***Neomys anomalus* Cabrera, 1907** - Mediterranean Water Shrew (Figs. 4A-B)

Type Locality: Spain, Madrid Province, Jarama River, San Martin de la Vega.

Diagnosis: HB 72–90 mm, T 45–60 mm, HF 14–18 mm and W 7–20 g. Hair smooth, black on dorsal and gray on the ventral, with a visible demarcation between the two; eyes small; pinna short; tail length medium, covered with coarse hairs; tail underside with white hairs, gradually becoming longer and denser towards the tip, forming a white tuft at the end; fore and hind limbs with five fingers, end with sharp claws; long hairs between hard pads and soles of fore and hind limbs; teeth tips reddish-brown.

Comments: Records from Fars Province by Esmaeili et al. (2008a) extended its known distribution range in Iran further to the south.

Distribution: Fig. 2 (16, 27).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**Order Chiroptera Blumenbach, 1779****Family Pteropodidae Gray, 1821****Genus Rousettus Gray, 1821**

***Rousettus aegyptiacus* (Geoffroy, 1810)** - Egyptian Rousette

Type Locality: Egypt, Giza.

Diagnosis: HB 118–148 mm, FA 84–99 mm, T 8–19 mm and W 100–170 g. Face fox-like; tail very short; interfemoral membrane reduced; second finger clawed; tragus absent; ear margin complete; dorsal fur grey to brown, slightly paler ventrally; males larger, with scent glands in the throat; eyes large.

Comments: Southern populations in Iran assigned to *R. a. arabicus* Anderson, 1902 (Karami et al. 2008), but Benda et al. (2012b) suggested that all Palearctic populations belong to the nominate subspecies, which is uniform in genetics but plastic in morphometric traits.

Distribution: Fig. 2 (20, 26, 27, 28, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**Family Rhinopomatidae Bonaparte, 1838****Genus Rhinopoma Geoffroy, 1818**

***Rhinopoma hardwickii* Gray, 1831** - Lesser Mouse-tailed Bat (Image 2C)

Type Locality: India, West Bengal.

Diagnosis: HB 51–71 mm, FA 47–60 mm, T 55–76 mm and W 11–14 g. Size intermediate between greater and small mouse-tailed bats; tail longer than forearm; calcar absent; dermal ridge on muzzle trigonid and more pronounced than in *R. muscatellum* Thomas, 1903; hairs pale grey brown on back, paler on the chest and belly; teeth 28; color similar to *R. muscatellum*, paler than *R. microphyllum* (Brünnich, 1782); nasal inflations not as developed as in *R. muscatellum*.

Distribution: Fig. 2 (10, 11, 18, 27, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

***Rhinopoma microphyllum* (Brünnich, 1782)** - Greater Mouse-tailed Bat

Type Locality: Egypt, Giza.

Diagnosis: HB 61–102 mm, FA 59–70 mm, T 30–63 mm and W 14–37 g. The largest mouse-tailed bat; tail shorter than forearm; calcar absent; tragus long and bluntly sickle-shaped; feet slender, but larger than those of other two species of *Rhinopoma*; interfemoral membrane small, posterior border slightly concave and inserted on each tibia distally at about three-quarters of its length; face, lips and upper throat nearly naked; lower back and extreme lower abdomen also naked; back hair

pale greyish-brown, slightly paler below; sagittal crest much more developed than that of *R. hardwickii*; teeth 28.

Comments: Akmal et al. (2011) concluded that the Iranian specimens belong to *R. m. harrisoni* Schlitter & DeBlase, 1974.

Distribution: Fig. 2 (7, 10, 18, 26, 27, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

***Rhinopoma muscatellum* Thomas, 1903** - Small Mouse-tailed Bat

Type Locality: Oman, Muscat, Wadi Bani Ruha.

Diagnosis: HB 47–69 mm, FA 42–54 mm, T 43–70 mm and W 8–15 g. The smallest mouse-tailed bat of Iran, some overlap in size with the smaller specimens of *R. hardwickii*; tail longer than forearm; calcar absent; muzzle dermal ridge low, may be flat-topped or with a slight median depression; feet slender and small; teeth 28; pelage fine and silky; back hairs pale grey brown, paler on abdomen and chest; tympanic bullae relatively larger than in other two mouse-tailed bats of Iran.

Distribution: Fig. 2 (10, 18, 26, 27, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**Genus Rhinolophus Lacépède, 1799**

***Rhinolophus blasii* Peters, 1867** - Blasius's Horseshoe Bat

Type Locality: Italy, Milan and Trieste.

Diagnosis: HB 46–54 mm, FA 40–51 mm, T 25–30 mm and W 12–15 g. Size medium; upper connecting process straight and pointed, not bent down; lower connecting process shorter, narrow and rounded; horizontal fold slightly indented in centre; ears and membranes light grey; dorsal fur grey brown, sometimes with lilac tinge; ventral fur lighter; second phalanx of the fourth finger not more than twice as long as the first phalanx.

Distribution: Fig. 2 (1, 2, 5, 10, 12, 17, 19, 21, 22, 23, 24, 25, 27, 28, 29).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

***Rhinolophus euryale* Blasius, 1853** - Mediterranean Horseshoe Bat (Image 2D)

Type Locality: Italy, Milan.

Diagnosis: HB 43–58 mm, FA 43–51 mm, T 22–30 mm and W 8–17.5 g. Size medium; upper connecting process pointed, bent slightly downwards; lower connecting process shorter; ears and membranes light grey; fur grey-brown with reddish or lilac tinge above, grey white



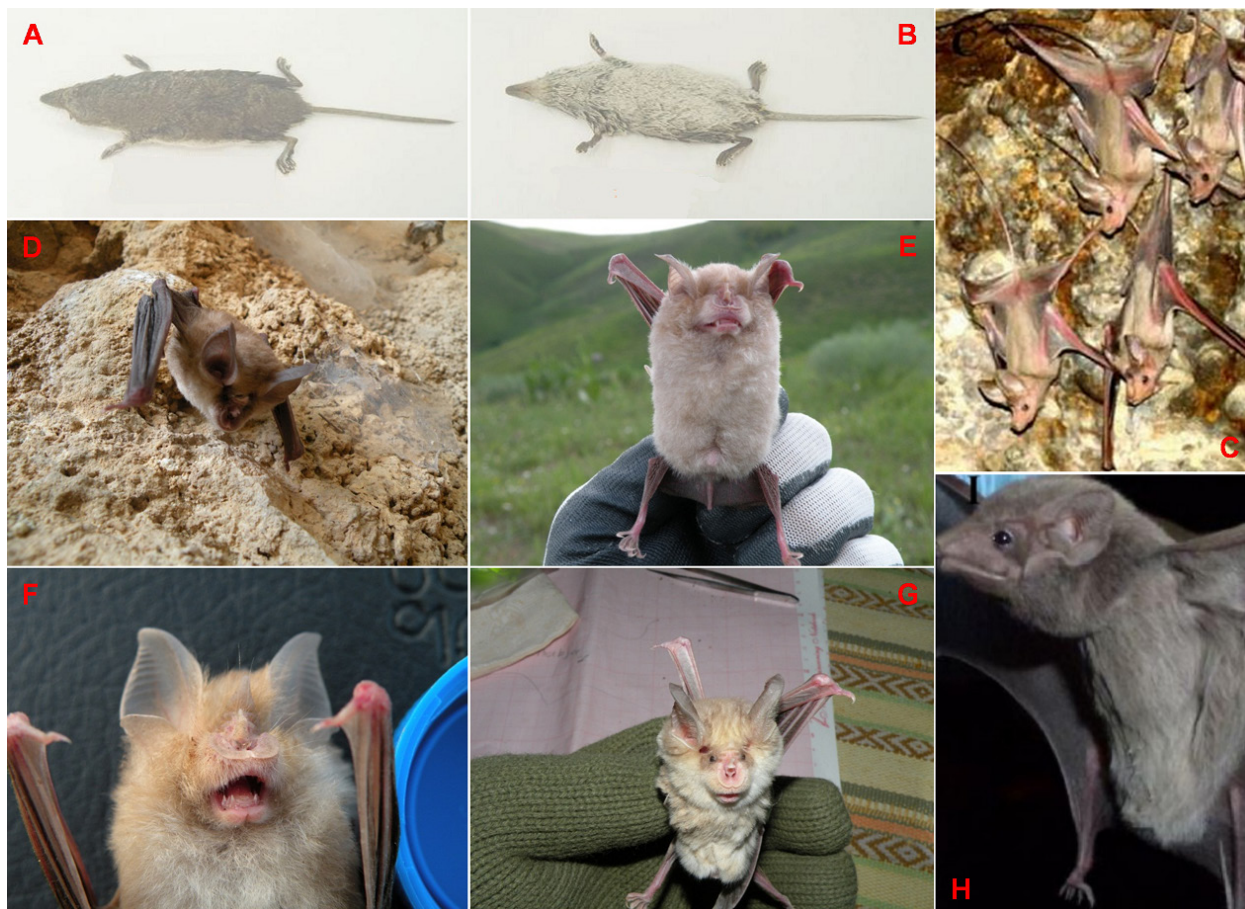


Image 2. A & B - *Neomys anomalus* (dorsal and ventral views); C - *Rhinopoma hardwickii*; D - *Rhinolophus euryale*; E - *Rhinolophus ferrumequinum*; F - *Rhinolophus hipposideros*; G - *Rhinolophus mehelyi*; H - *Taphozous perforatus*. © H.R. Esmaeili & V. Akmal.

below; second phalanx of the fourth finger more than twice as long as the first phalanx; may hibernate with open wings.

Distribution: Fig. 2 (1, 4, 7, 8, 11, 16, 19, 20, 21, 23, 27).

Conservation status: IUCN: Near Threatened; CITES: not listed; DOE: unsupported.

***Rhinolophus ferrumequinum* (Schreber, 1774)** - Greater Horseshoe Bat (Image 2E)

Type Locality: France.

Diagnosis: HB 54–71 mm, FA 51–61 mm, T 31–44 mm and W 13–34 g. Largest horseshoe bat; horseshoe relatively narrow and does not cover the whole muzzle; sella relatively small, constricted in the middle, widened below and narrowed above; lower connecting process pointed; upper connecting process short, bluntly rounded; lancet hastate, tip long and slender; third metacarpal short; in the nominate subspecies, ears and membranes light grey-brown, juveniles distinctly greyer;

*Rhinolophus ferrumequinum irani* paler; pale fawn above, the hair bases pale drab darkening to pale fawn at the tip; underparts pale drab; wraps itself completely in wing membranes when torpid.

Comments: Shahabi et al. (2017) concluded that two subspecies are found in Iran, *R. f. irani* (Type locality: Iran, Fars Province, Shiraz) in southern Iran and *R. f. proximus* in northern Iran.

Distribution: Fig. 2 (1, 2, 3, 4, 5, 6, 7, 11, 12, 15, 17, 19, 21, 23, 26, 27, 28).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

***Rhinolophus hipposideros* (Bechstein, 1800)** - Lesser Horseshoe Bat (Image 2F)

Type Locality: France.

Diagnosis: HB 37–45 mm, FA 34–42 mm, T 23–33 mm and W 59g. Smallest horseshoe bat; upper connecting process rounded; lower connecting process longer and pointed; fur soft and fluffy, grey-brown on dorsal surface

and lighter underneath; all fur on youngsters body gray; wraps its wings completely around the body when torpid.

Distribution: Fig. 2 (1, 3, 4, 5, 6, 7, 10, 11, 12, 15, 19, 23, 27, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

***Rhinolophus mehelyi* Matschie, 1901** - Mehely's Horseshoe Bat (Image 2G)

Type Locality: Romania, Bucharest.

Diagnosis: HB 42–64 mm, FA 48–56 mm, T 21–37 mm and W 10–23 g. Slightly larger than *R. blasii* and *R. euryale*; upper connecting process relatively blunt, slightly longer than the lower; lower connecting process wide and rounded from front view; lancet tapers rapidly in upper half; fur grey-brown above, almost white below; ears and membranes light grey; second phalanx of fourth finger more than twice as long as first phalanx.

Distribution: Fig. 2 (1, 4, 7, 19, 27).

Conservation status: IUCN: Vulnerable; CITES: not listed; DOE: unsupported.

#### Family Emballonuridae Gervais, 1855

##### Genus *Taphozous* Geoffroy, 1818

***Taphozous perforatus* Geoffroy, 1818** - Egyptian Tomb Bat (Image 2H)

Type Locality: Egypt, Kom Ombo.

Diagnosis: HB 56–73 mm, FA 58–66 mm, T 14–28 mm and W 20–30 g. Morphologically similar to *Taphozous nudiventris* but distinctly smaller and fully covered with soft and silky fur on both dorsal and ventral surfaces, down to the root of the tail; dorsal hairs bicoloured with white bases and sepia brown tips; ventral side grey or greyish-brown; gular sac absent; the ears tall and narrow with about 10 transverse ridges; tragus club-shaped; the tail protrudes through the dorsal surface of the interfemoral membrane at the mid-point; less-developed calcar than *T. nudiventris*; the wings are long and narrow and the membranes are brownish; a well-developed pouch of skin on the ventral side of the carpus, between the base of fifth finger and the forearm; the braincase smooth, lacking the powerful sagittal crest of *T. nudiventris*; the upper incisor minute; the second upper premolar attains the height of the canine.

Comments: The Jahrom record (Fars Province) represents one of the northernmost sites of *T. perforatus* in the Asian part of the species range (Benda et al. 2012a).

Distribution: Fig. 2 (27, 30).

Conservation status: IUCN: Least Concern; CITES: not

listed; DOE: unsupported.

#### Family Hipposideridae Lydekker, 1891

##### Genus *Asellia* Gray, 1838

***Asellia tridens* (Geoffroy, 1813)** - Geoffroy's Trident Leaf-nosed Bat

Type Locality: Egypt, Thebes.

Diagnosis: HB 50–62 mm, FA 44–54 mm, T 21–30 mm and W 6–13 g. Size small; the nose leaf with three distinctive vertical processes above the horseshoe; central process pointed, outer two blunt, tail protruding 3–5 mm beyond the interfemoral membrane; ears fairly large, with a very convex outer margin; fur soft, fluffy and dense, variable from reddish or bright orange to pale brownish-grey or pale yellow on the back, paler whitish buff on the belly; small upper premolar absent.

Distribution: Fig. 2 (10, 18, 26, 27, 28, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

##### Genus *Triaenops* Dobson, 1871

***Triaenops persicus* Dobson, 1871** - Persian Leaf-nosed Bat

Type locality: Iran, Fars Province, Shiraz.

Diagnosis: HB 51–64 mm, FA 49–55 mm, T 31–39 mm and W 8–15 g. Slightly larger than *Asellia tridens*; tail tip does not protrude from the interfemoral membrane; pinna with a conspicuous notch on the inner margin; color light grey brown on the back and pale buff on the belly; some individuals tinted with orange-red; noseleaf with three long vertical projections, fourth one projects from the centre; second phalanx of the fourth digit with a spicule of bone projecting transversely into the wing membrane; a small first upper premolar present.

Distribution: Fig. 2 (26, 27, 29).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

#### Family Vespertilionidae Gray, 1821

##### Genus *Eptesicus* Rafinesque, 1820

***Eptesicus serotinus* (Schreber, 1774)** - Common Serotine

Type Locality: France.

Diagnosis: HB 66–92 mm, FA 46–58 mm, T 47–56 mm and W 18–35 g. Size large; snout broad; face and ears black-brown; ears moderately tall (14–22 mm), with broad tragus less than half the height of the ear; dorsal fur long (11mm) and silky; hairs dark brown at base, with shiny lighter tips, golden brown in some populations; ventral fur lighter, yellow-brown or grey-brown, with no distinct demarcation along the neck; tail

tip protrudes from interfemoral membrane by 5–6 mm; calcar half-length of tail membrane; narrow postcalcarial lobe present; wings broad (5th finger longer than 59mm); upper tooth-row (CM<sup>3</sup>) more than 72mm; southwestern form of the country larger than northern forms, northwestern form darker than southwestern and northeastern forms.

Comments: Except an isolate from Fars Province (*E. s. shiraziensis*).

Type locality: Shiraz, Fars Province, Iran), DeBlase (1980) assigned most of the records from Iran to the nominate subspecies.

Distribution: Fig. 2 (1, 3, 5, 6, 9, 14, 15, 16, 17, 24, 27).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

***Eptesicus anatolicus* Felten, 1971** - Anatolian Serotine

Type Locality: Turkey, Alanya.

Diagnosis: HB 61–77 mm, FA 43–52 mm, T 42–59 mm and W 14–21 g. A medium-sized serotine, smaller than *E. serotinus* (Schreber, 1774) but larger than *E. bottae* (Peters, 1869); snout shorter and tragus narrower than in *E. serotinus*; face, ears and flight membranes deep black and in contrast with the paler fur; dorsal hairs shorter (8.5mm) than in *E. serotinus*, bicolored with brown base and honey to blond tips; ventral fur whitish-grey; youngsters darker with more grey shades and a less strongly contrasting ventral side; penis broader at the tip; skull wider, braincase higher than that of *E. bottae*; upper tooth-row (CM<sup>3</sup>) less than 7mm; second upper incisors small, barely taller than the cingulum on the first incisors.

Comments: DeBlase (1980) reported one site, Darab, Fars Province; Benda et al. (2012a) added further records from Jahrom, Fars Province, southern Iran.

Distribution: Fig. 2 (7, 11, 18, 20, 27, 28).

Conservation status: IUCN: Not Evaluated; CITES: not listed; DOE: unsupported.

**Genus *Nyctalus* Bowdich, 1825**

***Nyctalus leisleri* (Kuhl, 1817)** - Leisler's Noctule

Type Locality: Germany, Hessen, Hanau.

Diagnosis: HB 48–72 mm, FA 47mm, T 35–48 mm and W 8–20 g. Size medium; similar to *N. noctula* (Schreber, 1774), but smaller and darker with a more pointed nose; tragus short, broad, and mushroom shaped, distally; long fur dark rufous brown on the back, lighter yellowish brown on the ventral; dorsal fur bicolored, hairs with a darker base; ears, nose and membranes dark brown

to black; underside of the wing membranes covered with hairs along the body and up along the arms to the fifth finger; tail membrane extends to the ankles with well-developed calcars; tail short and barely protrudes beyond the membrane.

Distribution: Fig. 2 (2, 15, 16, 23, 27).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**Genus *Pipistrellus* Kaup, 1829**

***Pipistrellus kuhlii* (Kuhl, 1817)** - Kuhl's Pipistrelle

Type Locality: Italy, Triest.

Diagnosis: HB 39–55 mm, FA 30–36 mm, T 30–45 mm and W 5–10 g. Size small, larger than *P. pipistrellus* (Schreber, 1774); dorsal fur bicolored, dark at base and lighter yellowish-brown at tips; free edge of the wing and tail membrane, particularly between the fifth digit and foot, with a white edge of variable width; ears small, with five transverse folds; tragus rounded, but not wider at the tip; first upper incisors with single cusp, second upper incisors very small; first upper premolars (p<sup>3</sup>) very small, displaced inside tooth row.

Distribution: Fig. 2 (1, 2, 3, 5, 6, 7, 10, 11, 14, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

***Pipistrellus pipistrellus* (Schreber, 1774)** - Common Pipistrelle

Type Locality: France, Normandy, Beauvais Cathedral.

Diagnosis: HB 36–51 mm, FA 28–34 mm, T 23–36 mm and W 4–8 g. Size small; face and ears dark brown to black, contrasting with the fur, chestnut to dark brown on the back and grey-brown on ventral side; internarial ridge absent; tragus half-length of ear, smoothly curved with round tip; tail membrane with no hair; fifth digit less than 42mm; calcar one third of interfemoral membrane; postcalcarial lobe obvious; penis gray; glans penis with a pale median stripe; first upper incisors bicuspid; second upper incisors as high as the secondary cusp of first incisors; first upper premolars (p<sup>3</sup>) small and partially concealed by canine, when viewed from the side.

Comments: Iranian specimens assigned to two subspecies, *P. p. pipistrellus* (Schreber, 1774) in north and *P. p. aladdin* Thomas, 1905 in west, southwest and northeast (DeBlase 1980). A molecular study failed to support this taxonomic division (Hulva et al. 2004).

Distribution: Fig. 2 (1, 2, 3, 5, 6, 7, 10, 11, 15, 16, 17, 19, 21, 23, 24, 27, 28, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.



**Genus *Hypsugo* Kolenati, 1856*****Hypsugo savii* (Bonaparte, 1837)** - Savi's Pipistrelle

Type Locality: Italy, Pisa.

Diagnosis: HB 40–54 mm, FA 32–38 mm, T 31–43 mm and W 5–10 g. Size small; dorsal fur long and silky; hairs bicolored, dark bases and tips may vary between pale and dark buff; ventral fur lighter, greyish-brown bases and yellowish-white to silver tips; no distinct line of demarcation along the neck; membranes, face and ears very dark; calcar poorly developed; postcalcarial lobe narrow; tip of tail projects about 3mm beyond interfemoral membrane; first upper incisor bicuspid, with secondary cusp about three-quarters the height of the principal one; first upper premolar ( $p^3$ ) small, or even absent, and hidden by the canine and large upper premolar.

Distribution: Fig. 2 (1, 2, 3, 4, 6, 14, 15, 17, 19, 23, 24, 27, 29).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**Genus *Myotis* Kaup, 1829*****Myotis blythii* (Tomes, 1857)** - Lesser Mouse-eared Myotis

Type Locality: India, Rajasthan, Nasirabad.

Diagnosis: HB 68–81 mm, FA 54–68 mm, T 49–71 mm and W 18–30 g. Largest myotis in Iran, distinguishable from other members based on forearm length; size cline in cranial measurements, culminating in west Iran; ears slightly shorter (22–29 mm) and narrower than in *M. myotis* (Borkhausen, 1797), with five to six folds along the outer edge; nose narrower and more pointed; feet smaller; thumb long measuring 11.5mm with the claw; tail relatively long; skull shorter but broader; cheek teeth smaller in breadth; color paler than *M. oxygnathus* Monticelli, 1885; dorsal fur uniform pale wood brown to dull grey; ventral fur lighter and broadly washed with cream buff.

Comments: For its parasites in Iran, see Sharifi et al. (2008), Vatandoost et al. (2010), and Hemmati et al. (2013).

Distribution: Fig. 2 (1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 14, 15, 16, 18, 19, 21, 23, 27, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

***Myotis capaccinii* (Bonaparte, 1837)** - Long-fingered Myotis

Type Locality: Italy, Sicily.

Diagnosis: HB 42–57 mm, FA 38–44 mm, T 35–47 mm and W 7–10 g. A medium-sized myotis with large and

strong feet with long bristles; nostrils markedly protrude forward; dorsal fur and wing membrane grey; ventral fur light grey or white; youngsters inconspicuously grey; face reddish-brown; ears and membranes grey; ears length medium (14–17 mm); tragus lanceolate, slightly S-shaped, reaching about half the height of the ear; wing membrane attached to tibia above ankle; dorsal and ventral sides of interfemoral membrane covered with downy hair to about centre; calcar straight, extending to one third of the interfemoral membrane.

Diagnosis: Fig. 2 (5, 7, 18, 27).

Conservation status: IUCN: Vulnerable; CITES: not listed; DOE: unsupported.

***Myotis emarginatus* (Geoffroy, 1806)** - Geoffroy's Myotis

Type Locality: France, Ardennes, Charlemont.

Diagnosis: HB 41–56 mm, PA 36–44 mm, T 38–52 mm and W 7–15 g. Size medium; ear length medium (17–20 mm), with a distinct notch at about two-thirds height; tragus pointed and more than half the length of the ear; fur dense and wooly; dorsal hairs tricolored, with a grey base, buff centre section and orange-brown tips; ventral fur yellow-grey; face, ears and membranes reddish-brown; calcar about half length of interfemoral membrane, fringed with short and soft hairs; individuals from southeast of Iran slightly larger and lighter.

Comments: Iranian populations assigned to *M. e. desertorum* (Benda et al. 2006).

Distribution: Fig. 2 (1, 7, 9, 12, 14, 15, 16, 23, 26, 27, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**Family Miniopteridae Dobson, 1875****Genus *Miniopterus* Bonaparte, 1837*****Miniopterus pallidus* Thomas, 1907** - Pale Bent-winged Bat

Type Locality: Iran, Golestan Province, near Bandar-i-Gaz.

Diagnosis: HB 58–67 mm, FA 43–48 mm, T 56–66 mm, W 10–19 g. Size medium; snout short ( $CM^3$  less than 6.2mm); forehead high domed; baculum absent; ears short (9–12 mm) and triangular, widely separated and not projecting above the top of the head; tragus short and curved, with a round tip; head and dorsal fur greyish-brown, paler and greyer than *M. schreibersii* (Kuhl, 1817); ventral side greyish-white; no demarcation line along the sides of the neck; wings long and narrow, with the second phalanx of the third finger about three times as long as the first phalanx; at rest, the third and



fourth fingers fold inwards at the joint between the first and second phalanx; tail very long; calcar reaches less than half the length of the interfemoral membrane; postcalcarial lobe absent; teeth 38; vestigial anterior premolar typical of the family.

Comments: The elevation of traditional subspecies *M. s. pallidus* Thomas, 1907 to full separate species status is confirmed by recent genetic and biogeographic studies and all Iranian populations affiliate taxonomically to it (Furman et al. 2010; Karami et al. 2016).

Distribution: Fig. 2 (1, 2, 3, 4, 5, 7, 8, 10, 11, 12, 16, 19, 23, 25, 27).

Conservation status: IUCN: Not Evaluated; CITES: not listed; DOE: unsupported.

### Family Molossidae Gervais in de Castelnau, 1855

#### Genus *Tadarida* Rafinesque, 1814

*Tadarida teniotis* (Rafinesque, 1814) - European Free-tailed Bat

Type Locality: Italy, Sicily.

Diagnosis: HB 81–92 mm, FA 57–64 mm, T 37–57 mm and W 22–54 g. Size large; ears long broad (25–32 mm), extend forward over the muzzle; tragus small rounded; antitragus large, rectangular; muzzle with five folds each side of the upper lip; half the tail projects beyond the free edge of the interfemoral membrane; fur short, soft and velvety; hairs dark grey on the back and lighter underneath.

Distribution: Fig. 2 (3, 6, 7, 11, 14, 15, 16, 18, 23, 26, 27, 28, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

### Order Carnivora Bowdich, 1821

#### Family Canidae Fischer de Waldheim, 1817

#### Genus *Canis* Linnaeus, 1758

*Canis aureus* Linnaeus, 1758 - Golden Jackal (Image 3A)

Type Locality: Iran, Lorestan Province, Benna Mountains.

Diagnosis: HB 75–105 cm, T 20–26 cm, SH 40–50 cm and W 7–15 kg. Larger than the Common Fox (*Vulpes vulpes* (Linnaeus, 1758)); muzzle narrow; ears big; tail bushy and short with a dark tip; tail and dorsal brownish-gray with black stripes, flanks tawny and ventral buff and white; areas around the lips, cheeks and throat white; five toes on the forefeet with the first inner finger being above the others; four toes on the hind feet.

Comments: Iranian specimens belong to the nominate subspecies (Ellerman & Morrison-Scott 1951).

Distribution: Fig. 2 (all provinces).

Conservation status: IUCN: Least Concern; CITES: Appendix III; DOE: unsupported.

#### *Canis lupus* Linnaeus, 1758 - Gray Wolf

Type Locality: Sweden.

Diagnosis: HB 90–130 cm, T 30–50 cm, SH 65–80 cm and W 20–80 kg. Largest wild canid in Iran; head large and wider; eyes oblique; neck heavily muscled, and held level with the spine; contrary to domestic dog does not raise its tail; muzzle long and powerful; fur composed of a thick undercoat and long coarse guard hairs; fur usually grey but sometimes whitish, buff, fawn or dark grey; tail bushy, black tipped with black hairs.

Comments: *Canis lupus pallipes* Sykes, 1831 is the suggested Iranian subspecies (Ellerman & Morrison-Scott 1951). Iranian populations are uniform in the size and shape of skull (Khosravi et al. 2012). Khosravi et al. (2013) and Aghbolaghi et al. (2014) concluded that hybridization between *C. l. pallipes* and *C. familiaris* (Linnaeus, 1758) is sporadic in the country and can be a threat to wolf populations.

Distribution: Fig. 2 (all provinces).

Conservation status: IUCN: Least Concern; CITES: Appendix II; DOE: unsupported.

#### Genus *Vulpes* Frisch, 1775

#### *Vulpes cana* Blanford, 1877 - Blanford's Fox

Type Locality: Pakistan, Gwadar.

Diagnosis: HB 34–47 cm, T 26–36 cm, SH 26–28 cm and W 0.7–1.6 kg. Distinguished from other foxes by its dark fur, large and bushy tail (as big as the animal itself) which is not white-tipped; ears wide and elongated; muzzle short; dorsal fur thick and brown-gray, interspersed with long black guard hairs; ventral dark yellow; head and neck gray; black tear lines run from the internal corner of the eye to the muzzle.

Comments: Lay (1967) reported specimens from Fars Province.

Distribution: Fig. 2 (10, 12, 21, 22, 24, 25, 27, 29).

Conservation status: IUCN: Least Concern; CITES: Appendix II; DOE: Endangered.

#### *Vulpes rueppellii* (Schinz, 1825) - Rüppell's Fox

Type Locality: Sudan, Dongola.

Diagnosis: HB 35–56 cm, T 25–39 cm, SH 25–30 cm and W 1.1–2.3 kg. Head, body and tail shorter than those of the common fox, but ears larger and wider; digitigrade; soles of the feet fully covered with hair; fore and hind feet relatively short; fur soft and dense, sandy or yellowish light orange, becoming grayish dark brown on the upper side and turning to white on the lower

parts; tail slightly darker than the body and is white-tipped; sides of the face and cheeks white; a dark tear-line runs from the corner of the eye to the mouth.

Comments: Iranian subspecies is *V. r. zarudnyi* Birula, 1912 (Ellerman & Morrison-Scott 1951).

Distribution: Fig. 2 (13, 21, 22, 23, 24, 26, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: Protected.

#### ***Vulpes vulpes* (Linnaeus, 1758) - Red Fox**

Type Locality: Sweden, Uppsala.

Diagnosis: HB 50–90 cm, T 30–50 cm, SH 35–45 cm and W 2.5–10 kg. Body medium sized; muzzle slender; ears long and pointed; tail long, bushy and white-tipped; coat varies from brownish-gray or reddish-brown to light cream; ventral lighter than the dorsal and creamy; backs of the ears black or brown; lips, face sides and cheek white; a black tear-line runs from the eyes to the mouth.

Comments: Iranian specimens assigned to three subspecies, *V. v. pusilla* Blyth, 1854, *V. v. flavescens* Gray, 1843 and *V. v. splendens* Thomas, 1902 (Witt & Deblase 1983).

Distribution: Fig. 2 (all provinces).

Conservation status: IUCN: Least Concern; CITES: Appendix III; DOE: unsupported.

### **Family Felidae Fischer von Waldheim, 1817**

#### **Genus *Caracal* Gray, 1843**

***Caracal caracal* (Schreber, 1776) – Caracal (Image 3B)**

Type Locality: South Africa, Table Mountain near Cape Town.

Diagnosis: HB 55–90 cm, T 22–34 cm, SH 40–50 cm and W 18kg. Female relatively smaller; slender, yet muscular with long, triangular ears with highly developed apical black tufts (almost 6cm); limbs long and slender; tail medium without a black tip; footpads wide; pelage uniform light sandy brown to a darker red-brown on the back; ventral and areas around the eyes and under the chin white; no pattern or spots on the body.

Comments: Suggested subspecies in Iran are *C. c. schmitzi* (Matschie, 1912) and *C. c. michaelis* (Heptner, 1945). *Caracal c. michaelis* is restricted to the northeast of Iran (Ellerman & Morrison-Scott 1951; Witt & Deblase 1983; Etemad 1985; Nowell & Jackson 1996; Farhadinia et al. 2007; Karami et al. 2008).

Distribution: Fig. 2 (7, 10, 11, 14, 17, 18, 21, 22, 23, 24, 27, 28, 29).

Conservation status: IUCN: Least Concern; CITES: Appendix I; DOE: Protected.

#### **Genus *Felis* Linnaeus, 1758**

##### ***Felis chaus* Schreber, 1777 - Jungle Cat**

Type Locality: Russia, NE Caucasus, Dagestan, Terek River.

Diagnosis: HB 55–94 cm, T 20–31 cm, SH 35–40 cm and W 5–12 kg. Larger than the wildcat; pelage grey to brownish-red with no distinctive marking on the body, except for occasional dark bands or spots on the limbs; tail tip with 2–3 black rings.

Comments: *Felis chaus chaus* Schreber, 1777 occurs in Iran (Ellerman & Morrison-Scott 1951).

Distribution: Fig. 2 (1, 2, 3, 4, 6, 7, 8, 9, 10, 15, 16, 17, 18, 23, 24, 26, 27, 28, 29, 30).

Conservation status: IUCN: Least Concern; CITES: Appendix II; DOE: Protected.

##### ***Felis margarita* Loche, 1858 - Sand Cat**

Type Locality: Algeria.

Diagnosis: HB 39–57 cm, T 28–35 cm, SH 24–30 cm and W 1.3–3.4 kg. Fur pale sandy to yellow over most of the body, with pallid bars, and white on the chin and ventral; black tipped tail with 2–3 black bands; two reddish lines run across the cheeks from the outer corners of the eyes; long hairs growing between toes that create a cushion of fur under the footpads; ears large and widely spaced.

Comments: Suggested subspecies in Iran is *F. m. thinobius* (Ognev, 1926).

Distribution: Fig. 2 (21, 22, 23, 24, 25, 27, 29).

Conservation status: IUCN: Least Concern; CITES: Appendix II; DOE: Endangered.

##### ***Felis silvestris* Schreber, 1777 - Wild Cat**

Type Locality: Germany.

Diagnosis: HB 50–80 cm, T 25–35 cm, SH 30–40 cm and W 3–6 kg. Tail long and bushy with widened black tip; muzzle short; eyes large; ears large and triangular shaped; fore and hind feet long and slender; body brown to grey; well-pronounced spots present on the body; body larger than that of a domestic cat, with more spots.

Distribution: Fig. 2 (all provinces).

Conservation status: IUCN: Least Concern; CITES: Appendix II; DOE: unsupported.

#### **Genus *Panthera* Oken, 1816**

***Panthera pardus* (Linnaeus, 1758) – Leopard (Image 3C)**

Type Locality: Egypt.

Diagnosis: HB 110–180 cm, T 60–100 cm, SH 45–78 cm and W 35–90 kg. Body large and muscular; head wide; legs short with strong paws; fur soft and short,





Image 3. A - *Canis aureus*; B - *Caracal caracal*; C - *Panthera pardus saxicolor*; D - *Hyaena hyaena*; E - *Ursus arctos*; F - *Equus hemionus onager* photographed in the Qatruiyeh National Park east of Fars Province. © S. Kafaie.

light buff, become lighter under the belly and covered with spots, or rosettes.

Comments: Iranian subspecies is *P. p. saxicolor* Pocock, 1927. Iranian lineage is a monophyletic group that diverged from a group of the Asian leopards in the second half of the Pleistocene (Farhadinia et al. 2015).

Distribution: Fig. 2 (all provinces). Although the species has a wide distribution in Iran, it has a low abundance. In Bamu National Park, seven adult leopards were identified and a density of 1.9 leopards/ 100km<sup>2</sup> was estimated (Khorozyan 2008).

Conservation status: IUCN: Vulnerable; CITES: Appendix I; DOE: Protected.

#### Family Herpestidae Bonaparte, 1845

##### Genus *Herpestes* Illiger, 1811

*Herpestes edwardsii* (Geoffroy, 1818) - Indian Gray Mongoose (Image 4A)

Type Locality: India, Madras.

Diagnosis: HB 32–48 cm, T 30–45 cm, HF 6.5–8 cm, E 1.5–2.5 cm and W 1.4–2 kg. Males larger; body long and slender; tail long covered with coarse hairs; ears





Image 4. A - *Herpestes javanicus*; B - *Sciurus anomalus*. © S. Kafaei.

round and small; fore and hind limbs short with long non-retractable and strong claws; snout elongated and pointed; eyes small; body covered with long and dense hairs which are light brown to red fawn on the back and lighter on the belly; tail color similar to that of the body with a dark reddish tip.

Comments: Khoobdel et al. (2016) documented the negative impacts of introduced *H. edwardsii* on biodiversity in the Abu-Musa Island, southern Iran.

Distribution: Fig. 2 (21, 27, 28, 29, 30).

Conservation status: IUCN: Least Concern; CITES: Appendix III; DOE: unsupported.

***Herpestes javanicus* (Geoffroy, 1818)** - Small Asian Mongoose

Type Locality: Indonesia, Java.

Diagnosis: HB 22–46 cm, T 22–29 cm, HF 4.4–5.2 cm, E 2–2.5 cm and W 0.3–1 kg. Male somewhat bigger with a wider head; distinguished from *H. Edwardsii* by its smaller size and less dense hair; head elongated; ears short; body slender; legs short; plantigrade with five toes on both front and hind legs; the soles of the front and hind feet naked and dark; body and tail grayish-brown spotted with small golden or olive dots; fur under the chin and throat creamy-buff; eyes relatively small with a brown ocular ring.

Distribution: Fig. 2 (18, 27).

Conservation status: IUCN: Least Concern; CITES: Appendix III; DOE: unsupported.

**Family Hyaenidae Gray, 1821**

**Genus *Hyaena* Brisson, 1762**

***Hyaena hyaena* (Linnaeus, 1758)** - Striped Hyena (Image 3D)

Type Locality: Iran, Lorestan Province, Benna Mountains.

Diagnosis: HB 112–184 cm, T 25–47 cm, SH 60–94 cm, and W 25–55 kg. Head and jaws large; ears long and narrow with bluntly pointed tips; neck bent downwards; forelimbs longer and stronger than the hind limbs; tail length medium, covered with long hair; a dense, tall mane extends from the back of the head to the beginning of the tail; pelage creamy white to gray with black or dark brown stripes; snout and around the eyes black; a black patch present on the throat; dorsal hair long, dense and gray in winter; digitigrade with four toes on the front and hind legs; moves the front and hind limb of each side of the body simultaneously while walking.

Distribution: Fig. 2 (5, 6, 7, 9, 10, 14, 16, 17, 18, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30).

Conservation status: IUCN: Near Threatened; CITES: Appendix III; DOE: unsupported.





Image 5. Roadkill *Lutra lutra*: A - lateral side of the head; B - ventral side of the head; C & D - foot; E - drop; F - habitat.  
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#### Family Mustelidae Fischer de Waldheim, 1817

##### Genus *Lutra* Brünnich, 1771

*Lutra lutra* (Linnaeus, 1758) - European Otter (Image 5)

Type Locality: Sweden, Uppsala.

Diagnosis: HB 60–90 cm, T 35–55 cm, HF 9–13 cm, E 2–3 cm, SH 30cm, and W 5–17 kg. Males larger; body long, slender and sinuous; head flattened with a short, blunt muzzle; neck ill-defined; vibrissae long and sensitive; eyes small; ears low and inconspicuous, scarcely projecting above the fur; tail thickened and muscular at the base, tapering sharply to the tip; limbs very short with broad feet and extensive interdigital webs that together with the tail; hair soft and dense, brown to grayish brown on the body and white under the chin and throat.

Distribution: Fig. 2 (1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 14, 15, 16, 18, 19, 20, 26, 27).

Conservation status: IUCN: Near Threatened; CITES: Appendix I; DOE: unsupported.

##### Genus *Martes* Pinel, 1792

*Martes foina* (Erxleben, 1777) - Beech Marten, Stone Marten

Type Locality: Germany.

Diagnosis: HB 40–54 cm, T 22–30 cm, HF 8–9 cm, E 3–5 cm, and W 1.1–2.3 kg. A cat-size mustelid; fur dark brown to pale grayish-brown; a wide white patch

starts from the chin and continues under the neck to the throat and then forks down and continues towards the forelimbs; dorsal fur in youngsters covered with grey hairs; body slender with a long and bushy tail and naked feet; tail longer and the pelt coarser than *Martes martes* (Linnaeus, 1758).

Distribution: Fig. 2 (1, 9, 10, 14, 15, 16, 17, 19, 20, 26, 27, 28, 29, 30).

Conservation status: IUCN: Least Concern; CITES: Appendix III; DOE: unsupported.

##### Genus *Meles* Brisson, 1762

*Meles meles* (Linnaeus, 1758) - Eurasian Badger

Type Locality: Sweden, Uppsala.

Diagnosis: HB 56–90 cm, T 15–20 cm, HF 9–11 cm, E 3–5.5 cm, SH 30cm and W 10–16 kg. Head small; tail short and thick, snout narrow; ears small but quite visible; neck short; limbs short and strong; feet bottoms covered with soft hairs; claws on the forelimbs strong, elongated with an obtuse end; back and flanks fur long and coarse, generally silvery-gray; belly and legs black; two black bands pass along the head, starting from the upper lip and passing upwards to the base of the ears; a wide white band extends between the two dark bands, from the nose tip through the forehead and crown.

Distribution: Fig. 2 (2, 3, 4, 5, 6, 9, 11, 14, 15, 16, 19, 21, 23, 27).

Conservation status: IUCN: Least Concern; CITES: not

listed; DOE: unsupported.

### Genus *Mellivora* Storr, 1780

***Mellivora capensis* (Schreber, 1776)** - Honey Badger

Type Locality: South Africa, Western Cape Province, Cape of Good Hope.

Diagnosis: HB 55–80 cm, T 16–23 cm, SH 23–28 cm, and W 5.5–14 kg. Males larger; upper side of the body lighter than lower; body black except for a large white band that covers the upper body, beginning at the top of the heads and extending to the base of the tails; upper band becomes darker with age; hair coarse and longer on hind legs and tail; the fore claws length may reach 40mm.

Comments: Three subspecies occur in Iran, *M. c. wilsoni* Cheesman, 1920, *M. c. indica* (Kerr, 1792) and *M. c. buechneri* Baryshnikov, 2000 (Baryshnikov 2000; Etemad 1985).

Distribution: Fig. 2 (16, 18, 24, 27, 28).

Conservation status: IUCN: Least Concern; CITES: Appendix III; DOE: unsupported.

### Family Ursidae Fischer de Waldheim, 1817

#### Genus *Ursus* Linnaeus, 1758

***Ursus arctos* Linnaeus, 1758** - Brown Bear (Image 3E)

Type Locality: Northern Sweden.

Diagnosis: HB 140–250 cm, T 6–14 cm, SH 90–110 cm, and W 100–250 kg. Male larger; head large; ears small and round; eyes small; tail very short; body covered with a dense, brown and sometimes darker or lighten fur; cubs dark brown with a lighter spot on the chest; plantigrade with five toes, with long and strong nails on fore and hind feet.

Comments: Etemad (1985) listed two subspecies, *U. a. syriacus* Hemprich & Ehrenberg, 1828 and *U. a. caucasicus* Smirnov, 1919, but Wozencraft (2005) synonymized them. Genetic analyses revealed a major clade within the Iranian Brown Bears, comprising 2–3 subclades, northern Iran, western Iran, and Fars Province subclade (Ashrafzadeh et al. 2016).

Distribution: Fig. 2 (1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 27).

Conservation status: IUCN: Least Concern; CITES: Appendix II; DOE: Protected.

### Order Perissodactyla Owen, 1848

#### Family Equidae Gray, 1821

#### Genus *Equus* Linnaeus, 1758

***Equus hemionus* Pallas, 1775** - Onager (Image 3F)

Type Locality: Russia, Transbaikalia, Dauria, Tarei-Nor.

Diagnosis: HB 200–250 cm, T 30–55 cm, SH 110–142 cm, E 17–20 cm and W 150–260 kg. Similar to the donkey, having long, narrow and pointed ears; dorsal yellowish-brown or orange and sides and the rumps, flanks, and venter white; males darker; moults in the spring; a short and black mane present on the neck; a distinctive dark brown stripe runs along the neck and backbone reaching the tail; a small dark patch present on the inner side of the femurs.

Comments: Suggested Iranian subspecies is *E. h. onager* Pallas, 1775; remaining populations occur in the Touran Protected Complex (Semnan) and Bahram-e-Goor Protected Area and Qatruiyeh National Park (Fars Province) (Hemami & Momeni 2013).

Distribution: Fig. 2 (22, 23, 24, 27, 28).

Conservation status: IUCN: Near Threatened; CITES: Appendix II; DOE: Endangered.

### Order Artiodactyla Owen, 1848

#### Family Suidae Gray, 1821

#### Genus *Sus* Linnaeus, 1758

***Sus scrofa* Linnaeus, 1758** - Wild Boar (Image 6A)

Type Locality: Germany.

Diagnosis: HB 100–185 cm, T 16–30 cm, SH 60–110 cm and W 50–300 kg. Body big; head large; neck short and thick; hand and feet with four digits extended to hoofs, but only middle toes reach to the ground; eyes small; muzzle long and cylindrical with nostrils on its flat tip; hair shaggy long, brown to grey in color but sometimes creamy yellow; youngsters with yellow and brown stripes; canines present in both upper and lower jaws; males with more developed canine teeth, visible as half-circle shaped tusks emerging from the mouth.

Comments: Suggested Iranian subspecies is *S. s. attila* Thomas, 1912 (Etemad 1985).

Distribution: Fig. 2 (all provinces).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

### Family Cervidae Goldfuss, 1820

#### Genus *Dama* Frisch, 1775

***Dama dama* (Linnaeus, 1758)** - Fallow Deer (Image 6B)

Type Locality: Sweden.

Diagnosis: HB 130–200 cm, T 16–20 cm, SH 85–100 cm and W 45–110 kg. Male's antlers broad and branched; numbers of points correlated with age; antlers shed in the winter and start growing in spring; length of antlers and their branches 50–70 cm and 7–20 cm, respectively; antlers in old males shorter and sometimes with no

branches; body covered with reddish orange short hairs on the back and flanks in summer; white spots present on the back and flanks which turns to the white line on the latter; body hair longer in winter and grey in color.

Comments: Suggested Iranian subspecies is *D. d. mesopotamica* (Brooke, 1875). The original habitats of Persian Fallow Deer in Iran were open landscapes with scattered trees and shrubs in Zagros Mountains in western Iran and woodlands in southwestern province of Khuzestan, however, habitat destruction and extensive hunting wiped out or severely reduced their populations. Now the small free remaining herds are scattered in woodlands along Karkheh and, perhaps, Dez rivers. Presently, the majority of Persian Fallow Deer in Iran live on Ashk Island in Urmia Lake and several enclosures throughout the country, including the Miankotal, Arzhan, and Parishan protected areas in Fars Province (Karami et al. 2016).

Distribution: Fig. 2 (2, 4, 7, 15, 18, 20, 24, 27).

Conservation status: IUCN: Least Concern; CITES: Appendix I; DOE: Protected.

#### Family Bovidae Gray, 1821

##### Genus *Gazella* Blainville, 1816

###### *Gazella bennettii* (Sykes, 1831) - Indian Gazelle

Type Locality: India, Deccan.

Diagnosis: HB 90–110 cm, T 15–20 cm, SH 55–65 cm, HL 32cm and W 15–25 kg. Smaller and darker than *G. subgutturosa* (Gueldenstaedt, 1780); winter fur in eastern populations dark grayish sandy, often with a distinct brown band edging the white underparts; summer fur reddish-brown; western populations larger, lighter, and lack the dark mid-facial region of the eastern populations; horns rather parallel with tips, sometimes turning in; horns longer in males; tail black, conspicuous against the white buttocks when raise in scape.

Comments: Iranian specimens are assigned to three subspecies, *G. b. fuscifrons* Blanford, 1873, *G. b. karamii* Groves, 1993, and *G. b. shikarii* Groves, 1993 (Groves 1993). There are four captive breeding centers in the country. For population status in Iran see Akbari et al. (2014).

Distribution: Fig. 2 (21, 22, 23, 24, 27, 28, 29, 30). In Iran, the current population is estimated at 2,818 individuals in 32 reserves (including Bahram-e Goor, Taron and Hormood protected areas in Fars Province) and additionally at least 500 individuals outside protected areas (Akbari et al. 2014).

Conservation status: IUCN: Least Concern; CITES: Appendix III; DOE: Protected.

###### *Gazella subgutturosa* (Gueldenstaedt, 1780) - Persian Gazelle (Image 6C,D)

Type Locality: Azarbaijan, Steppes of East Transcaucasica.

Diagnosis: HB 90–115 cm, T 16–20 cm, SH 70–80 cm and W 20–45 kg. Males horns reach 25–45 cm in length, black and sharply diverging, and form an S-shaped, bending up backward and turning in at the tips; females lack horns, but in western Iran females with short horns observed; males with a goiter-like bulge on the throat during the mating season; legs long; tail quite short; fur short and sandy during the warm season, replaced by thick and brownish fur in winter, and becomes lighter with increasing age.

Comments: Two subspecies are listed for Iran, *G. s. subgutturosa* (Gueldenstaedt, 1780) and *G. s. seistanica* Lydekker, 1910 (Etemad 1985), but a genetic analysis is required to verify them. *Gazella subgutturosa marica* is a distinct lineage, currently regarded as *G. marica* (Wacher et al. 2010).

Distribution: Fig. 2 (5, 9, 11, 12, 14, 17, 18, 21, 22, 23, 24, 25, 26, 27, 30). The current population of Persian Gazelle in Iran is estimated less than 20,000 individuals (Karami et al. 2016). The remaining population in Fars Province is limited to Bamau National Park and Basiran hunting prohibited region in north of Fars Province.

Conservation status: IUCN: Vulnerable; CITES: not listed; DOE: Protected.

##### Genus *Capra* Linnaeus, 1758

###### *Capra aegagrus* Erxleben, 1777 - Wild Goat (Image 6E)

Type Locality: Russia, NE Caucasus, Dagestan.

Diagnosis: HB 120–160 cm, T 15–20 cm, SH 70–100 cm and W 25–120 kg. Males with long scimitar shaped horns marked with annual growth rings that could reach 152cm in length; females with short horns (few centimeters); body stocky and muscular; fur brownish or yellowish gray; males darker; adult males with a beard and a black stripe running from the withers down the front of the shoulders merging with the black chest; become pale with increasing age, and cream-white on the sides and flanks in an advanced age; front of their feet with black hairs; fur paler in winter; males with special sebaceous glands under the tail.

Comments: Iranian subspecies are the nominate one and *C. a. blythi* Hume, 1875.

Distribution: Fig. 2 (all provinces of Iran).

Conservation status: IUCN: Vulnerable; CITES: Appendix I; DOE: unsupported.



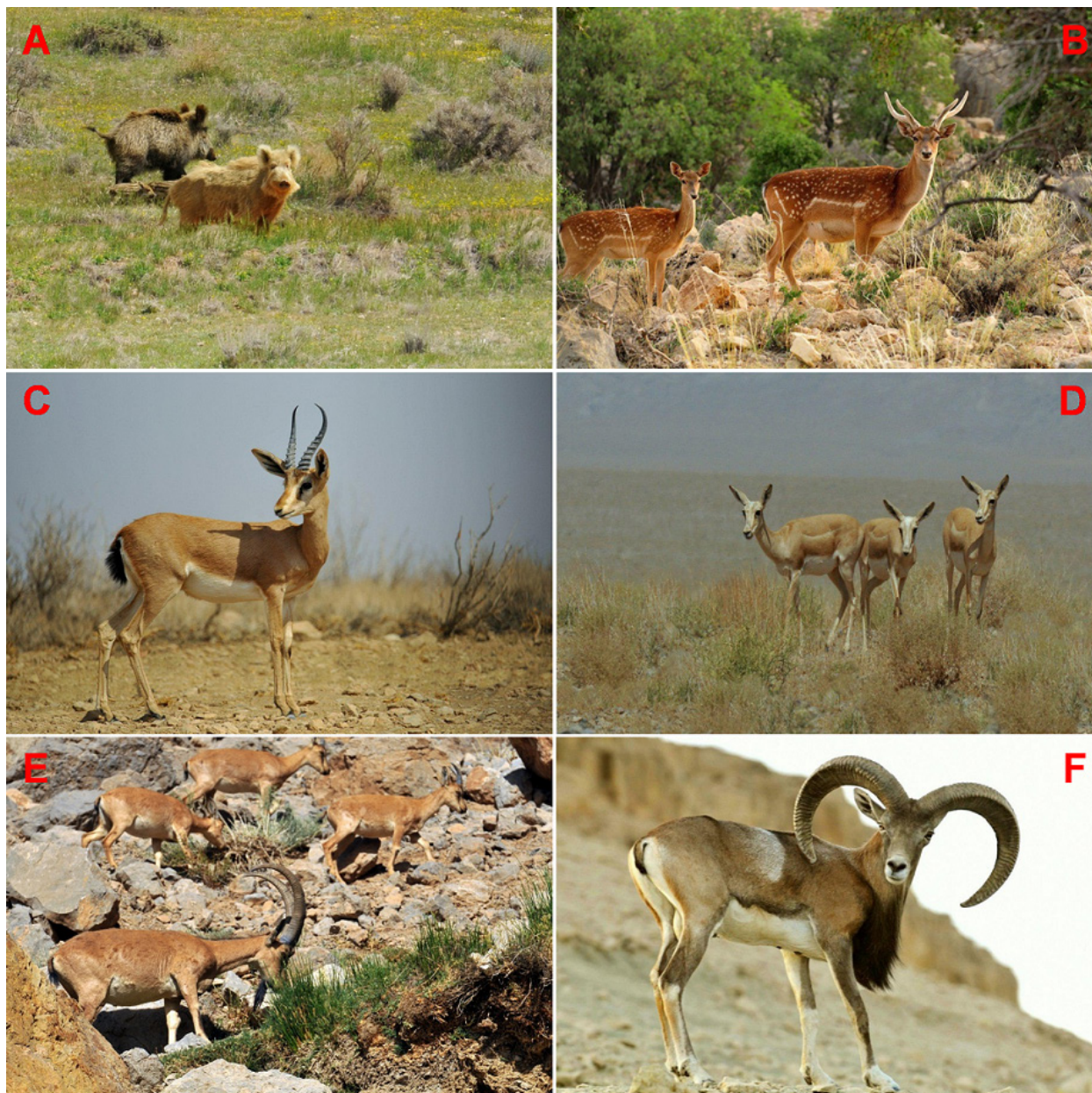


Image 6. A - *Sus scrofa*; B - *Dama dama mesopotamica*; C - male *Gazella subgutturosa*; D - female *Gazella subgutturosa*; E - *Capra aegagrus*; F - *Ovis orientalis*. © S. Kafaei.

#### Genus *Ovis* Linnaeus, 1758

***Ovis orientalis* Gmelin, 1774** - Mouflon (Image 6F)

Type Locality: Iran, Eastern Alborz Mountains.

Diagnosis: HB 140cm, SH 80cm, and W 20–65 kg. Males larger, with horns shorter than the horns of male Urial Wild Sheep and with somewhat elliptical cross sections; horns curve in the same plane towards the neck; chest and throat hairs rough, short and range from brown to black; females lack horns or with short and slightly curved horns; males with a white or gray saddle patch in winter.

Comments: Four subspecies are recognized in Iran, *O. o. laristanica* Nasonov, 1909, *O. o. isphahanica* Nasonov, 1910, *O. o. gmelinii* Blyth, 1841 and *O. o. arkal* Eversmann, 1850 (Ziaie 1996). Distribution of Laristan sheep *O. o. laristanica* is limited to southern and western parts of Fars and Hormozgan provinces. Hormood and Geno protected areas are well-known habitats for this population. Laristan rams are the smallest rams in the world with adult males weighing less than 35kg. Shiraz ram is a hybrid between Armenian (*O. o. gmelinii*) and Larestan (*O. o. laristanica*) populations. Horns are similar



to Laristan rams but with a large body size. Distribution is limited to areas surrounding Shiraz, especially Bamou National Park (Karami et al. 2016). Based on a molecular study, Rezaei et al. (2010) concluded that wild sheeps in Iran form two monophyletic groups (*O. orientalis* in western parts and *O. vignei* in eastern parts of the country) and other populations throughout Iran are hybrids of these two species.

Distribution: Fig. 2 (1, 2, 4, 5, 7, 8, 9, 10, 11, 12, 13, 18, 19, 21, 27, 28, 30).

Conservation status: IUCN: Vulnerable; CITES: Appendix II; DOE: Protected.

### Order Rodentia Bowdich, 1821

#### Family Sciuridae Fischer de Waldheim, 1817

##### Genus *Sciurus* Linnaeus, 1758

***Sciurus anomalus* Gmelin, 1778** - Caucasian Squirrel (Image 4B)

Type Locality: Georgia, Sabeka, 25km southwest of Kutaisi.

Diagnosis: HB 190–210 mm, T 128–143 mm, HF 50–60 mm, E 27–29 mm and W 330–430 g. Body size medium; tail long and bushy; upper parts brown with a tint of russet red; under parts yellow; tail shorter than the head-body length; top of the tail russet red and lighter on the bottom; claws delicate and long, with a dark base becoming lighter towards the tips; eyes large; ears relatively long.

Distribution: Fig. 2 (1, 4, 7, 10, 11, 19, 20, 21, 27).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

#### Family Dipodidae Fischer de Waldheim, 1817

##### Genus *Allactaga* Cuvier, 1836

Comments: For a molecular phylogeny of the genus *Allactaga* in Iran, see Dianat et al. (2013).

***Allactaga elater* (Lichtenstein, 1828)** - Small Five-toed Jerboa

Type Locality: Western Kazakhstan, Kirgiz Steppe.

Diagnosis: HB 90–128 mm, T 148–185 mm, HF 46–58 mm, E 25–38 mm and W 32–73 g. Smallest jerboa in Iran; muzzle short and wide; ears long, when folded forward, extend beyond the muzzle; pelage dark grey on the back with buff tipped hairs; flanks lighter and venter white; a white bar on the thigh, which unites with the white color on the venter; tail tuft with three colors of hair, short off-white hairs, followed by 3cm black hairs and 2cm long white hairs at the tip; hind feet with five fingers; feet soles naked; a pair of small premolars on the upper jaw; small incisors with no grooves.

Comments: Occurrence of five subspecies is likely in Iran, *A. e. elater* (Lichtenstein, 1828), *A. e. caucasicus* Nehring, 1900, *A. e. indica* Gray, 1824, *A. e. aralychensis* (Satunin, 1901) and *A. e. turkmeni* Goodwin, 1940 (Shenbrot et al. 2008). Mohammadi et al. (2016) suggested the existence of two additional mitochondrial lineages.

Distribution: Fig. 2 (1, 3, 8, 9, 12, 14, 16, 17, 18, 22, 23, 25, 27, 28, 29).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

##### Genus *Jaculus* Erxleben, 1777

Comments: For an integrative taxonomic study in Iran, see Darvish et al. (2016).

***Jaculus blanfordi* (Murray, 1884)** - Blandford's Jerboa

Type Locality: Iran, Bushehr.

Diagnosis: HB 108–136 mm, T 170–218 mm, HF 60–67 mm, E 18–23 mm and W 77–93 g. Largest *Jaculus* in Iran; eyes large; ears small; hind limbs long; front limbs short; fur on the dorsum creamy yellow, and pure white on the venter; tail tuft 5cm long, dark brown at the base with a 3cm white tip; hind feet with three toes, with vestigial lateral ones; feet soles covered with long hairs; premolars absent.

Comments: There is an intraspecific geographic variation in second lower molar shape in *J. blanfordi* so that northern and southern populations are determinable, which strengthen the idea of occurrence of two subspecies in northeast and southeast of Iran (Darvish et al. 2016). Results of genetic analysis by Melnikova & Naderi (2017) uncovered two distinct lineages, thus supporting the presence of two subspecies, *J. b. blanfordi* (Murray, 1884) and *J. b. turkmenicus* Vinogradov & Bondar, 1949.

Distribution: Fig. 2 (13, 14, 17, 21, 23, 25, 27, 28, 29).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

#### Family Calomyscidae Vorontsov & Potapova, 1979

##### Genus *Calomyscus* Thomas, 1905

Comments: For an integrative taxonomy of the genus *Calomyscus* in Iran, see Sahebjam et al. (2010), Shahabi et al. (2012), Shahabi (2013), Shahabi et al. (2013), and Zarei et al. (2013b).

***Calomyscus bailwardi* Thomas, 1905** - Zagros Mountains Calomyscus

Type Locality: Iran, Khuzestan Province, southeast of Ahwaz, Izeh.

Diagnosis: HB 70–92 mm, T 82–100 mm, HF 20–23 mm, E 19–26 mm and W 10–24 g. Body small; ears long and tail bushy; snout rounded; eyes large; hind feet delicate with five toes; part of the feet soles covered with white hair, while the rest naked; body orange brown on top and white underneath; flanks dark; ears long, bare, light and covered with scattered hairs; the frontal base of the ears with a small white patch; upper parts of the fore and hind limbs white; lower part of the tail pure white.

Comments: Akbarirad et al. (2016) revealed the existence of four groups in Iran and concluded that the Zagros Mountains has promoted geographic isolation in the genus *Calomyscus*. Group B includes the samples from the southeastern part of the Zagros including Fars Province.

Distribution: Fig. 2 (4, 10, 11, 18, 19, 20, 21, 27, 28, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

#### Family Cricetidae Fischer, 1817

##### Genus *Arvicola* Lacépède, 1799

*Arvicola amphibius* (Linnaeus, 1758) - Eurasian Water Vole

Type Locality: England.

Diagnosis: HB 146–186 mm, T 100–136 mm, HF 30–33 mm, E 15–17 mm and W 80–200 g. Largest vole in Iran; head large; muzzle wide and short; eyes small; ears short and hide among hairs; dorsal hairs dark brown mixed with orange and grey; flank darker, turning to black; ventral grey, sometimes tinted with orange yellow; tail long and almost half of the head-body length, covered with short hairs; cartilaginous scales visible; soles of fore and hind limbs bare; incisors yellow-orange; molar teeth grow continuously as incisors.

Distribution: Fig. 2 (1, 2, 4, 5, 7, 8, 11, 12, 14, 15, 21, 27).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

##### Genus *Chionomys* Miller, 1908

*Chionomys nivalis* (Martins, 1842) - European Snow Vole

Type Locality: Switzerland, Berner Oberland, Faulhorn.

Diagnosis: HB 110–140 mm, T 50–70 mm, HF 18–22 mm, E 16–18 mm and W 38–50 g. Tail long yellow, almost half the head-body length; fur long and dense, which is light brown mixed with gray, gradually gives away to gray on the sides; ventral fur white gray; soles

of fore and hind limbs naked; claws white and pointed; pinna small.

Comments: Mahmoudi et al. (2017) concluded that *C. layi* Zikov, 2004 is synonymous with *C. nivalis*.

Distribution: Fig. 2 (5, 15, 19, 23, 27).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

##### Genus *Microtus* Schrank, 1798

*Microtus irani* Thomas, 1921 - Iranian Vole

Type Locality: Iran, Fars Province, Shiraz, Bagh-i-Rezi.

Diagnosis: HB 100–107 mm, T 34–39 mm, HF 18–19 mm and W about 300g. Similar to Social Vole; pelage olive-buff above; flanks paler; ventral off-white.

Comments: To date, five different cytotypes were reported for this species that made it a notorious example of an unstable taxonomy (Zima et al. 2013).

Distribution: Fig. 2 (27). The first report was from an orchard near Shiraz at 1,700m. It was described by Thomas, 1921 from the southern border of *Microtus* species range (Shiraz-Iran) (Karami et al. 2016). A recent study on chromosomal data of *Microtus* species from Iran have revealed two different cytotypes (2n=48, 64) from the type locality (Mahmoudi et al. 2014). Mahmoudi et al. (2014) also confirmed the limited scope of *M. irani* just to the type locality (Shiraz), and showed more extended range of *M. i. karamani* between Iran, Lebanon and Turkey.

Conservation status: IUCN: Data Deficient; CITES: not listed; DOE: unsupported.

##### Genus *Cricetulus* Milne-Edwards, 1867

*Cricetulus migratorius* (Pallas, 1773) - Gray Dwarf Hamster

Type Locality: Western Kazakhstan, lower Ural River.

Diagnosis: HB 85–115 mm, T 20–35 mm, HF 14–19 mm, E 15–20 mm and W 35g. Body small; face wide; muzzle pointed; fur gray on the back and white underneath; between upper and lower fur marked; tail creamy and very short, about quarter of body length; tail terminates with a tuft; ears long and if folded forward would reach the eyes; pinna gray and ellipsoid, with short and thin hairs on the outer surface.

Distribution: Fig. 2 (all provinces except 12, 13, 18, 26 and 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**Family Muridae Illiger, 1811****Genus *Gerbillus* Desmarest, 1804*****Gerbillus nanus* Blanford, 1875** - Baluchestan Gerbil

Type Locality: Pakistan, Gedrosia.

Diagnosis: HB 70–90 mm, T 108–125 mm, HF 19–22 mm, E 11–13 mm and W 10–15 g. Size small; tail long (1.5 times of the head-body length) and covered with hair throughout its length, ends with a small tuft; fur long, soft and dense; eyes large; muzzle narrow; moustaches well grown and black and white; each foot with five toes and naked soles; body upper parts light brown with a shadow of gray; face covered with lighter fur; a white crescent area present above the eye and the base of the ear; under parts fur, from cheeks to tail, pure white; between upper and lower parts on the flanks quite demarcated.

Comments: Sympatric occurrence of long-tailed and short-tailed morphotypes has been reported in the country (Siahsarvie & Darvish 2007).

Distribution: Fig. 2 (17, 18, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**Genus *Meriones* Illiger, 1811**

Comment: For a morphometric study of the genus in Asia and northern Africa see Darvish (2009).

***Meriones hurrianae* Jerdon, 1867** - Indian Desert Jird

Type Locality: India, Delhi, Hurriana District.

Diagnosis: HB 125–142 mm, T 138–145 mm, HF 30–34 mm, E 12–13 mm and W 50–70 g. Size medium; hairs short and rough; fur on upper part sandy grayish-buff, on fore and hind feet lighter and on ventral side grayish or creamy; no demarcation line between fur color on back and lower side; tail as long as head-body length; color of the upper part of the tail same as upper part of the body, and lower side lighter; fore- and hind feet thick with long black claws; ears short and somewhat triangular; eyes relatively small.

Distribution: Fig. 2 (27, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

***Meriones persicus* (Blanford, 1875)** - Persian Jird

Type Locality: Iran, Kohrud Mountains, north of Esfahan.

Diagnosis: HB 120–198 mm, T 150–195 mm, HF 35–42 mm, E 20–25 mm and W 55–100 g. Tail longer than head-body length; back color yellowish brown with a brown or black shade; ventral side white from chick

to tail; hairs gradually become taller in the final third part of the tail which terminates with a tuft at the end; tail upper side with the same color as the back of the body, lower side white and wheat brown; ears large and triangular; pinna covered with short hairs on outer surface, but inner surface bare; hind limbs tall; the soles of the hind feet bare, only on the fringes of heels and near toes covered with white hairs; hind limbs claws white; a white patch obvious above the eyes.

Comments: Subspecies in Fars Province is *M. p. ambrosius* Thomas, 1919; Dianat et al. (2016) concluded that it is close to the nominate subspecies, thus additional analyses are needed to validate its status.

Distribution: Fig. 2 (throughout the country with the exception of deserts, northern and southern coastal areas).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**Genus *Tatera* Lataste, 1882*****Tatera indica* (Hardwicke, 1807)** - Indian Gerbil

Type Locality: India, United Province, between Benares and Hardwar.

Diagnosis: HB 125–190 mm, T 145–205 mm, HF 20–38 mm, E 20–36 mm and W 100–225 g. Size relatively big and rat-like; tail thick, bushy and longer than head-body length; hairs become longer at the tip of the tail, establishing a small terminal tuft; upper part of the body light brown with a black shadow; under part white; boundary between upper and lower part obvious; tail dark above and below, and pale along the sides; fore and hind feet long; the soles of the feet naked; ears long with rounded pinnae.

Comments: Two main phenetic groups occur in the Iranian populations, northern vs. southern (Mirshamsi et al. 2007).

Distribution: Fig. 2 (7, 18, 20, 23, 25, 26, 27, 28, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**Genus *Acomys* Geoffroy, 1838*****Acomys dimidiatus* (Cretzschmar, 1826)** - Eastern Spiny Mouse

Type Locality: Egypt, Sinai.

Diagnosis: HB 85–110 mm, T 95–120 mm, HF 17–20 mm, E 15–19 mm and W 30–60 g. Similar to house mouse, but somewhat larger; tall and rough hairs (spines) cover soft hairs of the back; tail bare, scaled and longer than head-body length; eyes and ears relatively large; pinna grey and its upper edge covered with soft,

short hairs; the soles of the feet and hands bare; the hairs on the back and lower parts yellowish-brown and white, respectively; a white spot present under eye and ear.

Distribution: Fig. 2 (26, 27, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

### Genus *Apodemus* Kaup, 1829

Comments: Radiation and distribution of *Apodemus* in the eastern Mediterranean is probably influenced largely by vicariance events during the Neogene including the uplifting of the Zagros Mountains and the Anatolian Plateau, climate oscillations, and formation of the Hyrcanian forests (Darvish et al. 2015).

#### *Apodemus witherbyi* (Thomas, 1902) - Steppe Field Mouse

Type Locality: Southern Iran, Fars Province, Shul.

Diagnosis: HB 93–104 mm, T 93–110 mm, HF 20–23 mm, E 15–17 mm and W 15–30 g. Body size and morphology similar to the house mouse, but hind feet longer and slender, eyes and ears larger, and upper incisors without cusps; fur light brown with a tint of russet; fur on abdominal side and limbs white; demarcation line along flanks very distinct; scales on tail easily visible; short, thin hairs cover tail sides and the terminal part of the tail; tail brown on upper part and white on abdominal side, with a clear demarcation line between them.

Distribution: Fig. 2 (1, 7, 10, 11, 15, 17, 19, 20, 22, 23, 27).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

### Genus *Mus* Linnaeus, 1758

#### *Mus musculus* Linnaeus, 1758 - House Mouse

Type Locality: Sweden, Uppsala.

Diagnosis: HB 65–100 mm, T 60–105 mm, HF 15–18 mm, E 11–15 mm and W 12–30 g. Tail long and thin; tail length exceeds head-body length; fur short, thin, soft and grey-brown above; a shadow of the golden yellow present above the body in some specimens; under parts of the body white; between darker back and lighter below demarcated; pinna well-developed and round above, covered with thin hairs; eyes small; snout relatively sharp; tail covered with short and thin hairs, but rings conspicuous; the soles of the feet, with the exception of lateral part, bare.

Comments: Iranian subspecies is *M. m. domesticus* Schwarz et Schwarz, 1943. Two additional subspecies

have been recognized more recently from northeast of Iran: *M. m. bactrianus* Blyth, 1846 from South Khorasan Province and *M. m. musculus* Linnaeus, 1758 from North Khorasan Province (Darvish 1995).

Distribution: Fig. 2 (all provinces).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

### Genus *Nesokia* Gray, 1842

#### *Nesokia indica* (Gray, 1830) - Short-tailed Nesokia

Type Locality: India [uncertain].

Diagnosis: HB 150–215 mm, T 90–130 mm, HF 30–45 mm, E 15–20 mm and W 130–180 g. Size large; muzzle short and round; hairs short, dense and soft with long black hairs visible among them; tail shorter than head-body length, covered with scales and scantily haired; hands and feet broad and short, with fingers and toes that end with long clear nails; pelage brownish yellow or grayish-brown with a red shade on upper parts that gradually merges with the light grayish under parts; incisors wide and strong.

Comments: Five subspecies have been reported for Iran (Ellerman 1961). Zarei et al. (2013a) conducted a geometric morphometric analysis of some populations in Iran.

Distribution: Fig. 2 (1, 7, 9, 14, 15, 16, 17, 18, 20, 22, 23, 25, 26, 27, 28, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

### Family Gliridae Muirhead, 1819

#### Genus *Dryomys* Thomas, 1905

#### *Dryomys nitedula* (Pallas, 1778) - Forest Dormouse

Type Locality: Russia, Lower Volga River.

Diagnosis: HB 80–113 mm, T 80–111 mm, HF 19–24 mm, E 10–17 mm and W 30–60 g. Body smaller than dormouse; two black stripes, encircling the eyes, visible on the face; eyes large; ears small and the upper part round without hairs; whiskers well developed, in 3–4 cm long; upper parts of the body in forested areas, olive brown and under parts light yellow, but in open areas back side yellowish gray and underside white; tail long, bushy; forelimb with four and hind limb with five fingers; soles of fore and hind limbs, except feet heels, naked.

Distribution: Fig. 2 (2, 3, 4, 14, 15, 17, 19, 21, 23, 24, 27, 28).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.



**Family Hystricidae Fischer de Waldheim, 1817****Genus *Hystrix* Linnaeus, 1758***Hystrix indica* Kerr, 1792 - Indian Crested Porcupine

Type Locality: India.

Diagnosis: HB 70–90 cm, T 8–10 cm, S 18–35 cm, and W 11–25 kg. The largest rodent in Iran; spines long and cover the body; tail quite short; muzzle broad and covered with rough hairs; vibrissae very long and sometimes reach 20cm on upper lip; body covered with rough hairs which partly change to spines on the back and flanks; short and bristle-like hairs present under and among spines; spines are slender and long on the neck and shoulders, thick and short on the back, marked with black and white bands; spines on the tail short and white.

Distribution: Fig. 2 (all provinces).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**Order Lagomorpha Brandt, 1855****Family Ochotonidae Thomas, 1897****Genus *Ochotona* Link, 1795***Ochotona rufescens* (Gray, 1842) - Afghan Pika

Type Locality: Afghanistan, Baber's Tomb, Kabul.

Diagnosis: HB 160–180 mm, T 15mm, HF 29–33 mm, 17–21 mm and W 150g. Resembles large rats; tail very small, only small part remains that hidden in the fur; feet not long as in hares and similar to hands; muzzle short and black, and white whiskers present around it; color could range from gray mixed with brown to gray mixed with reddish-brown; flanks gradually become lighter and blend with the color of the under parts which is a mixture of grayish-yellow; no visible boundary presents between upper and lower parts.

Distribution: Fig. 2 (1, 4, 7, 8, 11, 12, 14, 15, 16, 17, 19, 21, 22, 23, 24, 25, 27, 28, 29, 30).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**Family Leporidae Fischer de Waldheim, 1817****Genus *Lepus* Linnaeus, 1758***Lepus europaeus* Pallas, 1778 - European Hare

Type Locality: Poland, Silesia.

Diagnosis: HB 40–70 cm, T 7–13 cm, HF 11–17 cm, E 8–12 cm and W 2–7 kg. Fore feet short, while the hind feet elongated; tail short; ears long; five digits on fore-foot and four in the hind foot, terminating with strong toes; dorsal coloration grayish clay-brown, becomes lighter on the flanks; chin, throat and belly white; tail bi-colored, with light under part and darker dorsal surface; ears grey, with a small black triangular patch at

the tip; soles of fore and hind feet covered with coarse, yellowish-brown long hairs.

Distribution: Fig. 2 (all provinces).

Conservation status: IUCN: Least Concern; CITES: not listed; DOE: unsupported.

**DISCUSSION**

Our purpose in this study was to gather all previously published data and our own data of extensive field expeditions and camera trapping to present a general view of the mammals of Fars. The current checklist shows that the mammalian fauna of Fars Province is rich and taxonomically diverse. Based on this checklist, mammalian fauna of Fars comprises 72 species in 53 genera, 28 families, and seven orders, a number which is equivalent to about 38.9% of all terrestrial mammal species recorded throughout the country (i.e., 185 species, Karami et al. 2016) and approximately 32.9% of all terrestrial mammal species recorded in Europe (i.e., 219 species, Temple & Terry 2007). Asiatic Lion *P. l. persica* Meyer, 1826 is extirpated in Iran with no decisive records in more than 70 years. It was widespread in Iran in the far remote past, covered a very significant part of the country throughout the western half, reaching Tehran in the north and Makran in southeast; however, in the last two centuries they were confined to southwest provinces of Khuzestan, Fars and Bushehr (Karami et al. 2016). In the late 1800s, the valley of Dasht-e Arzhan and Miankotal area in Fars Province were famous for their lions (Blanford 1876, Nowell & Jackson 1996). Main causes of extinction were habitat loss, poaching, and persecution. A reintroduction program was in place in mid-1970s in order to establish a sustainable population of *P. l. persica* in Arzhan and Parishan protected area, west of Shiraz, but abandoned afterward (Karami et al. 2016).

Iran is the confluence point of major zoogeographic realms (Coad 2017). It has been infiltrated by many mammal species coming from different zoogeographic regions, which have advanced to a greater or lesser depth within the country. The result is thus a composite mammalian fauna, in which native species are mixed with Palearctic elements, as well as with others of Oriental and Ethiopian origin. From the biogeographic perspective, southern Iran has acted as a bridge between Oriental and Ethiopian realms (Frey & Probst 1986; Coad & Vhlenkin 2004; Madjnoonian et al. 2005). The mammals of Fars must in general be regarded as Palearctic, however, genera such as *Acomys* Geoffroy,

1838, *Meriones* Illiger, 1811, and *Gerbillus* Desmarest, 1804, are equally prevalent in the Sahara and must therefore be regarded as only marginally Palearctic. Many non-Palearctic species have made their way into southern Iran by different routes. Indian fauna entered the country mainly from Balochistan region, southeastern Iran. The introduction of African elements was probably in the region of Bandar Abbas (Hormozgan Province), south of Fars (Fig. 2), and the penetration must have occurred during the Quaternary, when the mainland was still continuous across the present Strait of Hormuz, which is now 34 miles wide. The African species did not infiltrate very far into the country, settling mainly in Baluchistan region (e.g., *Acomys dimidiatus*) (De Misonne 1968). *Acomys dimidiatus* entered southern Iran from the west passing northern edge of Persian Gulf reaching south of Pakistan (Etemad 1978, Firouz 1999, Frynta et al. 2010). Connection was made between India and Iraq through southern Iran by some elements (e.g. *Tatera indica*), originally belonging to hot regions, and the degree of their infiltration northward depended on their capacity for adapting to the cold (De Misonne 1968).

Besides its large area (i.e., 1,22,608km<sup>2</sup> or 7.4% of the total area of Iran, making it the fourth largest province in the country) and special biogeographic position which we discussed above, biodiversity in Fars Province also has an ecologic background (Esmaeili & Teimori 2017). Fars Province possess three main terrestrial ecoregions, including the central Persian desert basins in the north and northeast, the Zagros Mountains forest steppe extended from northwest to the southeast, and the Nubo-Sindian desert and semi-desert ecoregion in the south, as well as numerous aquatic ecoregions including at least 10 lakes and 29 rivers (Olson et al. 2001). A wide range of geographic and physiographic conditions, coupled with climatologically diverse environments in this province, have provided enormous habitat diversity for many mammalian species with different physiologic adaptations.

Unlike high species diversity, population trend for most mammalian species in Iran is declining. Among 72 reported species here, 60 species (83.3%) are considered as Least Concern (LC) in the IUCN Red List. The reason for this large number of species categorized as LC is the scanty of data about the species at national level. This shows the necessity of reconsideration of global categories and application of the IUCN Red List criteria at the national level (Esmaeili et al. 2017). It seems that habitat destruction, illegal hunting, road accident, restricted habitats and severe drought, especially in

the recent years due to climate changes are the main anthropogenic and natural factors affecting mammals of Fars Province (e.g., Tatin et al. 2003; Hamadanian 2005; Ghoddousi et al. 2008b, 2009, 2016; Ashayeri & Newing 2012; Zareian et al. 2012; Ghadirian et al. 2016).

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