

Vertebrates of Kuh-e-Gorm non-hunting area, Jahrom, Iran: Diversity, conservation and challenges

Zareian, H.^{a*}, Gholamhosseini, A.^{b,c}, Esmacili, H.R.^a, Teimori, A.^d

^a Department of Biology, Faculty of Sciences, Shiraz University, Shiraz 71454, Iran.

^b Department of Biology, Faculty of Sciences, Ferdowsi University of Mashhad, Mashhad, Iran.

^c Department of Biodiversity, Institute of Science and High Technology and Environmental Sciences, Graduate University of Advanced Technology, Kerman, Iran.

^d Department of Earth and Environmental Sciences, Palaeontology and Geobiology and GeoBio-Center LMU, Germany.

The “Kuh-e-Gorm” non-hunting area is located in the northwest of Jahrom city, Fars province, Iran. Since there is no adequate knowledge on fauna of this region, a survey was conducted on the vertebrate fauna of the region from April 2007 to April 2008. In total, 124 vertebrate species were identified including: 11 fishes (belong to 10 genera, four families and three orders), four amphibians (belong to three genera, three families and one order), 20 reptiles (belong to 20 genera, 10 families and three orders), 70 birds (belong to 54 genera, 31 families and 10 orders) and 19 mammals (belong to 17 genera, 13 families and six orders). Two species namely, *Suncus etruscus* and *Bufo surda surda* were reported for the first time from this area which extend their former known ranges in Iran. Presence of *Hyla savignyi*, *Nectarinia asiatica* and *Lutra lutra* are notable in the area in term of geographical distribution range boundaries in Iran. Among identified vertebrates, 86 species are considered as Vulnerable (VU), Least Concerned (LC), Near Threat (NT) and Data Deficient (DD) using the IUCN categories in Red Data Book. Overgrazing and land use changes are the major threats of the wildlife in this area. In order to protect the species and habitat diversity, it is suggested that this non-hunting area to be considered as a protected area.

Key words: Range extension, Conservation, Fars province, Koh-e-Gorm

INTRODUCTION

The definition and establishing of the protected areas in different categories (like; national park, protected, natural and non-hunting areas) is one of the initially and important step in conservation policy of biological diversity. Therefore, understanding the different characteristics of these areas such as; biological diversity, ecological capacity, and gene pools seem to be an essential background in order to applying a better conservational management (Dixon and Sherman, 1990). Among the mentioned areas, the non-hunting areas are basic and suitable places in order to apply a preliminary conservation programs and more often play a supporting role in wildlife management. However, the non-hunting areas are protected from hunting and capture of animals and dedicated to conservation of specific wildlife species (Arbhabhira et al., 1988). Compared to the protected areas and national parks, non-hunting areas are smaller, protection is devoted only for specific species or

group of organisms, and usually fishing, tourism, logging, and collection of plants are allowed (Dixon and Sherman, 1990). Although generally protected area and national parks are more important as conservational perspective, non-hunting areas should also be considered to protect and conserve biological diversity of the regions.

Currently, there are approximately 16 non-hunting areas in Fars province, Iran. Although most of these are important in terms of their climate conditions, geographical location and animal composition, details on their biological diversity and conservation policy are unknown or poorly known (Zareian, 2009). Therefore, this is the first attempt to study the vertebrate fauna of the Kuh-e-Gorm, a non-hunting area, as a preliminary program to provide fundamental data for applying an appropriate management program.

The aims of this study are: (i) identifying vertebrate fauna of non-hunting area and (ii) discuss the threats and conservation policy for the main vertebrate groups.

MATERIAL AND METHODS

Study area

The "Kuh-e-Gorm" is a mountainous region in northwest of Jahrom (Fig. 1), Fars province, Iran (28° 33' to 28° 51' N and 53° 06' to 53° 33' E). This area has been considered as non-hunting area since 1995 by Department of Environment. The study area comprised of three principal habitat types: lowlands, rocky mountains and freshwater sources in the altitude range of approximately 800-2100 m. The main water source, Ghare-Aghaj river, lies on the extreme western boundary of the area. The average annual rainfall for the Kuh-e-Gorm ranges between 300-400 mm. The mean annual temperature ranges from 19°C in higher elevations to 23°C on the river flats. The mean long term annual evaporation ranges from 2200-2800 mm (Zareian, 2009).

Sampling

Fish

The fish specimens were collected using electroshocker, dip net, and cast net from different habitat types in Ghara-Aghaj river, Qanats and spring systems and then identified using Coad (2012).

Amphibians and Reptiles

The amphibian specimens were collected by hand and dip nets and identified using references publications such as Balouch and Kami (1995) and Stöck et al. (2001).

The reptiles were mostly collected by hand and pit fall trapping. Three quadrates (with the same size of 100×100 m) in different elevations were selected (see Table 1 for details) and a total of 225 pitfall traps in two sizes (85mm lip diameter with 205mm depth and 187mm lip diameter with 270 mm depth) created within the quadrates. The quadrates were rechecked after each 21 days during three months. Active searches were conducted for reptiles (out of quadrates) in suitable habitats. Snakes were collected with care using hand and sampling hook. The specimens were identified using several available identification keys (Anderson, 1999a; Latifi, 2000; Firouz, 2000; Rastegar-Pouyani et al., 2005; Rastegar-Pouyani et al., 2008).

Birds

Birds observations were conducted daily in the early hours of morning and late afternoon when avian activities are usually at its greatest. Identification of bird were carried out with the help of binoculars and some bird were caught using mist nets (2.5 m ×10 m and 16 mm mesh size) and then identified using Mansoori (2008).

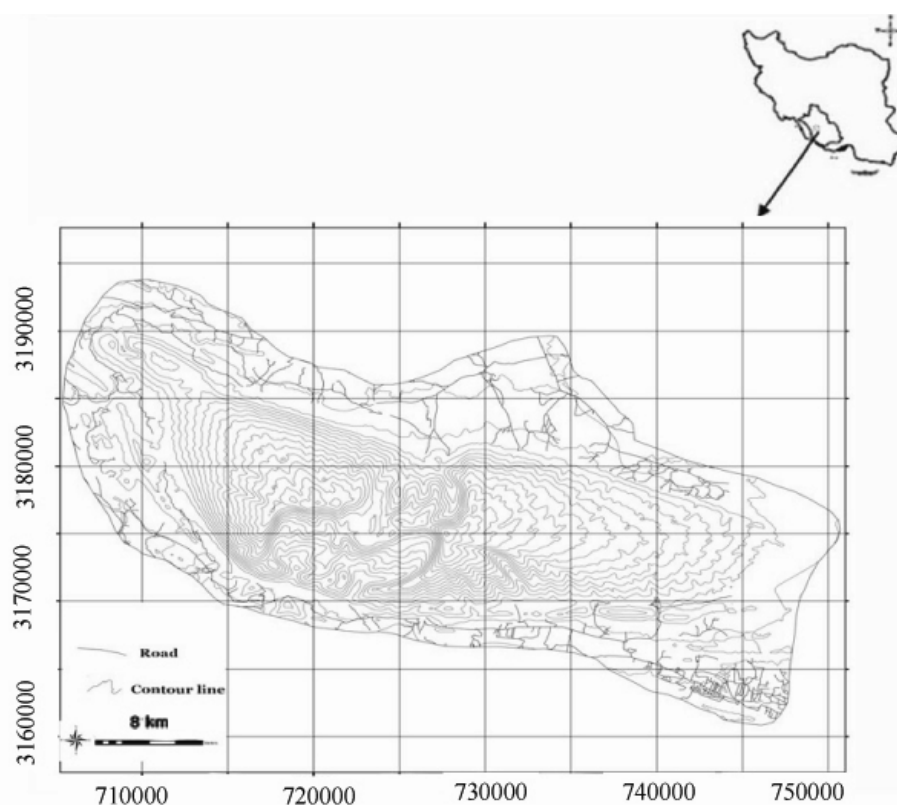


FIGURE 1. Kuh-e-Gorm, non hunting area in Fars province, south of Iran.

Mammals

The mammals were studied using different methods (camera traps, live traps, snap traps, and observation by spotlight at night). Each month, traps were baited with a mixture of cheese and fresh cucumber and set for two nights. Traps were placed in the afternoon and checked the following morning. In order to identify the specimens, Etemad (1984), Ziaie (2008), Corbet (1978) and Krystufek and Vohralik (2001) were used.

The taxonomy of Coad (2012) for classification of fishes, Anderson (1999a) and Rastegar-Pouyani et al. (2008) for amphibians and reptiles, Dickinson (2003) for birds and Karami et al. (2008) for mammals were followed. All the collected materials were deposited in the Zoological Museum-Collection of Biology Department, Shiraz University (ZM-CBSU).

RESULTS

The faunal composition recorded from Kuh-e-Gorm area in current survey is typical elements of south Iran fauna plus some new-recorded species. The majority of recorded species were recorded based on observation and ground searches rather than trapping. In total, 124 species were identified, including: 11 fish (belong to 10 genera, four families and three orders including three endemic species), four amphibians (belong to three genera, three families and one order) namely, *Bufo viridis*, *Rana rhidibunda*, *Hyla savignyi* and *B. surda*, a new recorded species for the area, 20 reptiles (belong to 20 genera, 10 families and three orders), 70 birds (belong to 54 genera, 31 families and 10 orders) and 19 mammals (belong to 17 genera, 13 families and six orders). All recorded species from the area are listed in Tables 2-6. The birds (with 70 identified species) and amphibians (with four identified species) represent the highest and lowest number of species diversity, respectively. The most diverse order in birds was Passeriformes with 42 species.

On the basis of different field works and study of trapped samples in quadrates, 20 reptile species including: two species of turtle and tortoise, eight species of snakes and 10 species of lizards were identified. Of these, seven species were trapped in quadrate pitfalls (Table 1). Colubridae (snakes) with six species and Gekkonidae (lizards) with three species have the highest species diversity among the families. Among these, *Testudo graeca* and *Varanus griseus* were rarely observed and *Ophisops elegans*, *Laudakia nupta*, *Trapelus agilis* and *Cyrtopodion scabrum* were the most abundant species.

TABLE 1. Quadrates details and specimens number of each species that trapped in

No.	Quadrate name	Longitude (UTM)	Latitude (UTM)	Altitude (m)	No. Specimen of each species						
					a	b	c	d	e	f	g
1	Pasgah	0729008	3184828	1210		5	6		1		
2	Koh-e-sefid	0727173	3180424	1542	1			4			3
3	Tange Television	0729632	3179467	2050				7		1	5

a- *Pseudocyclophis persicus* b- *Trapelus agilis* c- *Mesalina watsonana* d- *Ophisops elegans* e- *Trachylepis aurata*
 f- *Tropicolotes helenae* g- *Ablepharus pannonicus*

TABLE 2. List of fish species in water bodies of Gorm area.

Row	Order	Family	Species
1	Cypriniformes	Cyprinidae	<i>Garra rufa</i>
2	Cypriniformes	Cyprinidae	<i>Cyprinion tenuiradius</i>
3	Cypriniformes	Cyprinidae	<i>Capoeta sadii</i>
4	Cypriniformes	Cyprinidae	<i>Capoeta mandica</i>
5	Cypriniformes	Cyprinidae	<i>Carassobarbus luteus</i>
6	Cypriniformes	Cyprinidae	<i>Luciobarbus barbulus</i>
7	Cypriniformes	Cyprinidae	<i>Tor gryp</i>
8	Cypriniformes	Cyprinidae	<i>Alburnus mossulensis</i>
9	Cypriniformes	Nemacheilidae	<i>Oxynoemacheilus persa</i>
10	Synbarnchiformes	Mastacembelidae	<i>Mastacembelus mastacembelus</i>
11	Cyprinodontiformes	<u>Poeciliidae</u>	<i>Gambusia holbrooki</i>

TABLE 3. List of Amphibian species in water bodies of Gorm area.

Row	Order	family	Scientific name
1	Anura	Bufo	<i>Bufo viridis</i>
2	Anura	Bufo	<i>Bufo surda</i>
3	Anura	Rana	<i>Rana ridibunda</i>
4	Anura	Hyla	<i>Hyla savignyi</i>

TABLE 4. List of reptile species in Gorm area following Rastegar-Pouyani et al. (2008).

Row	Order	Family	Species
1	Testudines	Testudinidae	<i>Testudo graeca</i>
2	Testudines	Geomydidae	<i>Mauremys caspica</i>
3	Sauria	Agamidae	<i>Laudakia nupta</i>
4	Sauria	Agamidae	<i>Trapelus agilis</i>
5	Sauria	Gekkonidae	<i>Cyrtopodion scabrum</i>
6	Sauria	Gekkonidae	<i>Hemidactylus persicus</i>
7	Sauria	Gekkonidae	<i>Tropicolotes belenae</i>
8	Sauria	Lacertidae	<i>Ophisops elegans</i>
9	Sauria	Lacertidae	<i>Mesalina watsonana</i>
10	Sauria	Scincidae	<i>Trachylepis aurata</i>
11	Sauria	Scinsidae	<i>Ablepharus pannonicus</i>
12	Sauria	Varanidae	<i>Varanus griseus</i>
13	Serpentes	Viperidae	<i>Echis carinatus</i>
14	Serpentes	Colubridae	<i>Pseudocyclophis persicus</i>
15	Serpentes	Colubridae	<i>Spalerosophis diadema</i>
16	Serpentes	Colubridae	<i>Platycephs rhodorachis</i>
17	Serpentes	Colubridae	<i>Hemorrhois ravergieri</i>
18	Serpentes	Colubridae	<i>Natrix tessellata</i>
19	Serpentes	Colubridae	<i>Eirenis punctatolineata</i>
20	Serpentes	Elapidae	<i>Walterinnesia morgani</i>

TABLE 5. List of bird species in Gorm area.

Row	Order	Family	Species
1	Ciconiformes	Ardeidae	<i>Ardea purpurea</i>
2	Ciconiformes	Ardeidae	<i>Ardea cinerea</i>
3	Ciconiformes	Ardeidae	<i>Ixobrychus minutus</i>
4	Anseriformes	Anserinae	<i>Anus platyrhynchos</i>
5	Falconiformes	Accipiteridae	<i>Circaetus gallicus</i>
6	Falconiformes	Accipiteridae	<i>Circus macrourus</i>
7	Falconiformes	Accipiteridae	<i>Buteo buteo</i>
8	Falconiformes	Accipiteridae	<i>Aquila chrysaetos</i>
9	Falconiformes	Falconidae	<i>Falco tinnunculus</i>
10	Galiformes	Phasianidae	<i>Ammoperdix griseogularis</i>
11	Galiformes	Phasianidae	<i>Alectoris chukar</i>
12	Charadriiformes	Charadriidae	<i>Vonellus indicatus</i>
13	Charadriiformes	Charadriidae	<i>Charadrius dubius</i>
14	Charadriiformes	Scolopacidae	<i>Tringa ochropus</i>
15	Columbiformes	Columbidae	<i>Columba livia</i>
16	Columbiformes	Columbidae	<i>Columba palumbus</i>
17	Columbiformes	Columbidae	<i>Streptopelia turtur</i>
18	Columbiformes	Columbidae	<i>Streptopelia senegalensis</i>
19	Columbiformes	Columbidae	<i>Streptopelia decaocto</i>
20	Apodiformes	Apodidae	<i>Tachymarpis melba</i>
21	Coraciformes	Alcedinidae	<i>Ceryle rudis</i>
22	Coraciformes	Alcedinidae	<i>Halcyon smyrnensis</i>
23	Coraciformes	Alcedinidae	<i>Alcedo attis</i>
24	Coraciformes	Meropidae	<i>Merops orientalis</i>
25	Coraciformes	Meropidae	<i>Merops persicus</i>
26	Coraciformes	Meropidae	<i>Merops apiasters</i>
27	Coraciformes	Coraciidae	<i>Caraciac garrulus</i>
28	Coraciformes	Coraciidae	<i>Caraciac benghalensis</i>
29	Coraciformes	Upupidae	<i>Upupa epops</i>
30	Piciformes	Picidae	<i>Dendrocopus sp.</i>
31	Passeriformes	Alaudidae	<i>Galerida cristata</i>
32	Passeriformes	Alaudidae	<i>Alauda arvensis</i>
33	Passeriformes	Alaudidae	<i>Ammomanes deserti</i>
34	Passeriformes	Alaudidae	<i>Melanocorypa calandra</i>
35	Passeriformes	Alaudidae	<i>Dellicho urbicum</i>
36	Passeriformes	Hirundinidae	<i>Hirundo rustica</i>
37	Passeriformes	Hirundonidae	<i>Hirundo daurica</i>
38	Passeriformes	Hirundonidae	<i>Hirundo rupestris</i>
39	Passeriformes	Motacillidae	<i>Motacilla cinerea</i>
40	Passeriformes	Motacillidae	<i>Motacilla alba</i>
41	Passeriformes	Pycnonotidae	<i>Pycnonotus leucogenys</i>
42	Passeriformes	Lanidae	<i>Lanius isabellinus</i>
43	Passeriformes	Lanidae	<i>Lanius excubitor</i>
44	Passeriformes	Lanidae	<i>Lanius senator</i>
45	Passeriformes	Turdidae	<i>Luscinia svecica</i>
46	Passeriformes	Turdidae	<i>Cercotrichas galactotes</i>

47	Passeriformes	Turdidae	<i>Phoenicurus ochruros</i>
48	Passeriformes	Turdidae	<i>Saxicola torquata</i>
49	Passeriformes	Turdidae	<i>Oenanthe picata</i>
50	Passeriformes	Turdidae	<i>Oenanthe alboniger</i>
51	Passeriformes	Turdidae	<i>Oenanthe xanthopygma</i>
52	Passeriformes	Turdidae	<i>Oenanthe isabellinus</i>
53	Passeriformes	Turdidae	<i>Monticola solitarius</i>
54	Passeriformes	Turdidae	<i>Monticola saxatilis</i>
55	Passeriformes	Turdidae	<i>Turdus merula</i>
56	Passeriformes	Turdidae	<i>Turdus philomelos</i>
57	Passeriformes	Timeliidae	<i>Turdoides caudatus</i>
58	Passeriformes	Sylviidae	<i>Hyppolais caligata</i>
59	Passeriformes	Sylviidae	<i>Sylvia nana</i>
60	Passeriformes	Muscicapidae	<i>Muscicapa striata</i>
61	Passeriformes	Paridae	<i>Parus major</i>
62	Passeriformes	Sittidae	<i>Sitta tephronata</i>
63	Passeriformes	Sittidae	<i>Sitta neumayer</i>
64	Passeriformes	Nectariniidae	<i>Nectarina asiatica</i>
65	Passeriformes	Fringilidae	<i>Rhodopechys obsoleta</i>
66	Passeriformes	Ploceidae	<i>Passer domesticus</i>
67	Passeriformes	Sturnidae	<i>Sturnus vulgaris</i>
68	Passeriformes	Corvidae	<i>Pica pica</i>
69	Passeriformes	Corvidae	<i>Pyrrhocorax pyrrhocorax</i>
70	Passeriformes	Corvidae	<i>Corvus corone</i>

TABLE 6. List of mammal species in Gorm area

Row	Order	Family	Species
1	Soricomorpha	Soricidae	<i>Suncus etruscus</i>
2	Chiroptera	Pteropodidae	<i>Rousettus aegyptiacus</i>
3	Rodentia	Gliridae	<i>Dryomys nitedula</i>
4	Rodentia	Cricetidae	<i>Cricetulus migratorius</i>
5	Rodentia	Muridae	<i>Mus musculus</i>
6	Rodentia	Muridae	<i>Acomys dimidiatus</i>
7	Rodentia	Muridae	<i>Tatera indica</i>
8	Rodentia	Muridae	<i>Apodemus wütherbyi</i>
9	Rodentia	Hystriidae	<i>Hystrix indica</i>
10	Lagomorpha	Leporidae	<i>Lepus europaeus</i>
11	Carnivora	Herpestidae	<i>Herpestes edwardsii</i>
12	Carnivora	Herpestidae	<i>Herpestes javanicus</i>
18	Carnivora	Mustelidae	<i>Lutra lutra</i>
14	Carnivora	Canidae	<i>Vulpes vulpes</i>
15	Carnivora	Canidae	<i>Canis lupus</i>
16	Carnivora	Canidae	<i>Canis aureus</i>
17	Carnivora	Hyaenidae	<i>Hyaena hyaena</i>
18	Artiodactyla	Bovidae	<i>Capra aegagrus</i>
19	Artiodactyla	Suidae	<i>Sus scrofa</i>

The results revealed several new records and range extensions for some taxa. Distribution of *Suncus etruscus* (mammal) and *Bufo surda surda* (amphibian) are reported for the first time for the Fars province and *Hyla savignyi* (amphibian), *Nectarinia asiatica* (bird) and *Lutra lutra* (mammal) are also notable species in term of distribution range boundaries in Iran.

DISCUSSION

Iran lies at a region of major zoogeographical interchange and its remarkable biodiversity has long been of interest to naturalists and scientists (Esmacili et al., 2010). It is evident that faunal diversity of Iran is far greater than what is reported by naturalists so far (Darvish et al., 2006), and there are some gaps in distribution study for many taxa. Faunal surveys are a fundamental step for wildlife management. The Gorm area lies on the southern end of the Zagros mountains. Its zoogeographical position, mountainous conditions, existence of pastures, presence of agricultural lands and presence of rivers, streams and qanats in this area have influence on its species richness. Most of the vertebrate species recorded at this area were expected with regard to known fauna for south of Iran. Some species are important in terms of distribution range and endemism and therefore, these are discussed in following parts.

Most of the fish species are collected from Qara-Aghaj drainage, which is the main hydrological system in this area and also is the most important subdivision of the greater drainage system in south of Iran so called Mond River basin which drains to the Persian Gulf. The presence of two endemic species in this basin (*Cyprinion tenuiradius* and *Oxynoemacheilus persa*) is notable. Availability of different habitats such as hot spring, spring-stream systems, rivers, and Qanat systems provided suitable ecological conditions in Kuh-e-Gorm area. It could be true as a main reason for diversity of other vertebrates in the region. Moreover, there are some Qanat systems in the area which provides suitable habitats for other aquatic organisms. In addition, it could be used as a water resource for the large vertebrates.

Like many regions around the world, freshwater ecosystems may well be the most endangered ecosystems and therefore, decline in biodiversity are far greater in freshwaters than in the most affected terrestrial ecosystems (Sala et al., 2000). Generally, fishes, particularly those of no economic value, do not receive attention from conservation bodies, as do birds and mammals since they are not as readily observed and perhaps have less aesthetic appeal.

Water diversion in south parts of Iran is a serious threatening factor of indigenous and endemic fishes (Teimori et al., 2010). This is also a dramatic threat for vertebrate fauna, especially fishes in Kuh-e-Gorm area. Drainage rehabilitations, which have changed the structure of the systems in area and water pollution from domestic and agricultural sources, which led to pollution, could be considered as further threats factors. Additionally, water contaminations have been seen in almost all habitats, in particular micro-habitats such as spring-stream systems and even macro-habitats like Ghare-Aghaj River. Drought in recent years is another threat which affects vertebrate diversity in this region. Furthermore, the most considerable threatened factor is dam construction on Ghare-Aghaj River, which will change the ecological conditions of the ecosystem in this basin. Introduction of exotic fish, *Gambusia holbrooki* is another potential threat to diversity of this region.

Persian amphibians are far less numerous than other groups of vertebrates, being restricted to environments that reliably provide at least seasonal water for breeding and are hence most available in the mountain drainages of the north and west (Anderson, 1999b). The semi-arid climate of Kuh-e-Gorm is not very suitable for large populations or diverse amphibian fauna, but the presence of some wells and Qanats and also the springs have relatively supported large number of individuals in this area. In total, four species of amphibians are known to occur within the studied area. The most abundant and frequently detected species include the *Rana ridibunda* and *Bufo viridis* found on surrounding of aquatic habitats. The other two, *Bufo surda* and *Hyla savignyi* are important

as they are reported from the region for the first time. The members of *Bufo surda* subgroup are known with small body size, extremely small or absent tympana and nearly squared parotids (Fig. 2). This species is represented with two subspecies namely, *B. s. surda* and *B. s. annulata* in Iran. The former is reported from SE-Iran in Kerman, Baluchestan and Hormozgan Provinces and W-Pakistan (Baluchestan), possibly restricted to mountain regions (Schmidtler and Schmidtler, 1969; Eiselt and Schmidtler, 1973; Anderson, 1985; Baloutch and Kami, 1995; Borkin, 1999). While, *Bufo surda annulata* (Schmidtler and Schmidtler, 1969) only known from the type locality in 70 Km S. Shiraz, Mehku, Fars province. In the present study, a single specimen of *B. surda* was collected from a well with 3m depth from Kuh-e-Gorm (28°43.329' N, 53°21.060' E, 1200 m), which seems to be *Bufo surda surda* but the validity of this specimen is currently questionable because of the low number of individuals.



FIGURE 2. *Bufo surda* from Gorm mountain, Fars province, south of Iran.

Hyla savignyi Auduin, 1827 is a Middle Eastern representative of a Euro-Siberian species of a genus that is primarily neotropical in distribution, with a few Holarctic species (Anderson, 1999b). This species is distributed through most of Iran's wet ecosystems in western half (Baloutch and Kami, 1995). Kuh-e-Gorm area may be considered as a southern limit for *Hyla savignyi* distribution in Iran. This species has found in rice farms of the area. Presence of this species in the studied area as a semi-arid area is notable.

Presences of different habitats and climates in Kuhe-Gorm area have been responsible for diversity of reptiles in the region so that more than 20 reptiles were identified from the area. Additional surveys may also provide evidences of more reptiles in the area. Additional observations maybe provide evidences of another reptile species in the area. Many reptiles appear to have been affected by the high levels of disturbance at low elevations in the area by agriculture and grazing. Two species considered to have declined most dramatically in the region are *Varranus griseus* and *Testudo graeca*. Eight species of snake recorded in Kuh-e-Gorm area, six of which belongs to the Colubridae, the most spacious of Iran's non-venomous snake family. Most snake species are cryptic and appear to occur in relatively low densities in the region. The viper, *Echis carinatus* referred to previous observation by Environmental officer, had widely distributed across the area but this species was not encountered during this survey. Although many snake species may be considered beneficial because they feed on rodent pests, a few are dangerous to human and this is one of the reasons of sever decline of *E. carinatus*.

The venomous snake, *Walterinnesia morgani* was reported based on an injured specimen in the area. Seven localities have so far been reported for *W. morgani* in Iran: Masjed-Soleiman and Hosseinieh in

northern Khuzestan; Pole-Dokhtar in southern Lorestan; Kazeroon in western, Seif-Abad in eastern, Evas in southern Fars and Isin in northern Hormozgan provinces (Javanmardi, unpublished data). The Kuh-e-Gorm is now added to distribution range of this elapid species. Beside the importance of this venomous snake species from biological and medical applications, this new locality is also notable.

There are very few species of birds that are narrowly restricted in distribution for Iran (Anderson, 1999b). The Kuh-e-Gorm area provides a range of habitats that support a high diversity of native bird species including 15 migrant species. Passeriformes are the most diverse group of birds in the area, with 42 recorded species. Among the passerine the most species-rich family is the Turdidae with 12 species.

Nectarinia asiatica Latham, 1790 is passerine and distributed widely from the Persian Gulf through south and south East Asia. These are resident birds in most parts of their range and do not move large distances. These are mainly found on the plains but going up to 2400 m in southern India and up to 1700 m in the Himalayas (Rasmussen and Anderton, 2005). This species is distributed in coastal regions of the Persian Gulf and Gulf of Oman in Iran including east Bushehr, Hormozgan, south Kerman and Seistan-va-Baluchestan (Mansoori, 2008). It seems this species is moving to northern parts of these provinces in recent years. The Kuh-e-Gorm area may be considered as the northern limit of its natural geographical range in south west of Iran.

Iran, lying on the crossroad of several biogeographic regions and supports a diverse mammal fauna (Karami et al., 2008). So far, 192 mammal species recorded for Iran. Of 19 recorded mammal species in the area, each rodent and carnivore mammals comprised of seven species. Small mammals are just as likely to become extinct as larger species, although the latter received the most public attention (Young, 1994). *Meriones persicus*, *Jaculus blanfordi*, *Gerbillus nanus* and *Allactaga elater* are listed by Department of Environmental Fars province for studied area. These species had never seen in the field works of this survey but their extensive distribution in Iran and habitats diversity of Gorm area could support presence of these species. *Jaculus blanfordi* has not yet been reported from Fars province, although has reported from Bushehr province (West Fars province), and additional sampling is needed to verify its occurrence in Fars province.

The bat, *Rousettus aegyptiacus* is the largest member of Chiroptera in Iran. Its distribution in Iran is limited to the south including: Baluchistan, Bushehr, Hormuzgan, and Fars provinces. Jahrom is one of the most important habitats for the species and a cave was found with a rich population of this species in Kuh-e-Gorm area.

Only one insectivore *Suncus etruscus* Savi, 1822 (Fig. 3) was recorded within the study area. Its distribution is in Southern Palaearctic and Indomalayan region and possibly also in sub-Saharan Africa. In western Palaearctic region, it is restricted to Mediterranean coasts of Europe, Asia and Africa. This is also found in the Caucasus, Turkmenistan, Uzbekistan, Iran, Syria, Iraq, Arabia and on many Mediterranean islands (Kryštufek and Vohralík, 2001). Its distribution in Iran is poorly documented and Lay (1967) gives records from N Iran (Golestan, Mazandaran). Further records are available from NW Iran (Moghan plain), NE Iran (NE Khorasan), W Iran (Kermanshah, Khuzestan), and S Iran (Fars) (Esmaeili et al., 2008; Karami et al., 2008; Ziaei, 2008; Benda, unpublished data).

The otter, *Lutra lutra* Linnaeus, 1758 of Mustellidae was recorded from Ghare-Aghaj River. Eurasian otters are distributed through most of Iran's aquatic ecosystems in north, west and south west of Iran (Karami et al., 2006). The species is found in most of Iran's rivers, lakes, pools of Gilan, Mazandaran, Azarbayegan, Tehran, Kordestan, Kermanshah, Markazi, Isfahan, Khorasan, Chaharmahal-Bakhtiari, Fars, Khozestan, and Lorestan provinces (Kiabi, 1993; Mirzaei, 2006). Extensive distribution, however, does not mean the species has a high population or high density (Karami et al., 2006). Eurasian Otters have been hunted cruelly in Iran because of their economic

value, and because they are piscivore (Karami et al., 2006). There is no survey on distribution range of *L. lutra* in Fars province. Although the Fars province is on the range distribution of this species, here this is recorded for the first time in Ghare-Aghaj River. It seems that this locality is on the southern boundaries of the species in Iran. This record is very important for programming, planning, and management policies in this region because this species is considered as NT in IUCN categories and index I in Cites appendixes.



FIGURE 3. *Suncus etruscus* from Gorm mountain, Fars province, south of Iran.

Conservation status

The Kuh-e-Gorm area is characterised by ongoing decline of some species of vertebrate fauna. The lower elevations of the area are often characterised by large areas of degraded land by agriculture and grazing. Hunting, to some extent, is the other major threat that menaces wildlife in the area. The fauna of Kuh-e-Gorm appear to be declining due to human impact and other threatening activities. Ongoing clearance, degradation, and land use changes are recognized as major threats to the long-term survival of many of unique and common animal species.

The status of the Kuh-e-Gorm vertebrata fauna shows that 86 species could be categorized as vulnerable (VU), low risk (LC), and near threat (NT) using the IUCN Red Data Book (Table 7). This constitutes 69.3% of the known fauna. *Testudo graeca* and *Capra aegagrus* are listed as VU. *Lutra lutra*, *Hyaena hyaena*, *Circus macrourus* and *Coracias garrulus* are listed as NT. As national status, *Aquila chrysaetos* is listed as endangered species.

Varanus griseus, *Lutra lutra*, *Canis lupus* are listed in I index, *Coracias garrulus*, *Aquila chrysaetos*, *Testudo graeca*, *Circus macrourus*, *Buteo buteo*, *Circaetus gallicus*, *Falco tinnunculus* are listed in II index of CITES (Table 7).

The conservation status of many species of animals remains only tentatively known because of the poor taxonomic knowledge of various groups and lack of information regarding their population status (Amori and Gippolit, 2003). Distribution information about species will enable managers to better management and decisions for conservation of threatened species in different area. A comprehensive conservation management plan should be developed for some species in Kuh-e-Gorm area. Local peoples should also get more education about importance of wildlife and its conservation.

Participation of local people and nongovernmental organizations (NGO) in conservation programs, increasing public awareness through the media and research on different aspects of biology and

ecology of wildlife especially native species are the major factors for biodiversity conservation of this area.

As (i) the rules and regulations applied to non-hunting areas could not prevent some threats such as habitat destruction and land use changes (ii) protection is also afforded only for specific species (iii) due to high species and habitat diversities, this is suggested that this non-hunting area to be considered as a protected area.

TABLE 7. Conservation status of the species within each group of vertebrate in Gorm area (<http://www.iucnredlist.org>)

Taxa	Data Deficient	Vulnerable	Near Threat	Low Risk	Total
Mammal	0	1	2	16	19
Bird	0	0	2	60	62
Reptile	0	1	0	0	1
Amphibian	0	0	0	4	4
Fish	0	0	0	0	0
Total	0	2	4	80	86

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