INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
ISSN Print: 1560–8530; ISSN Online: 1814–9596
09–253/MHB/2010/12–2–271–275
http://www.fspublishers.org

Full Length Article

Floristic Study of Khan-Gormaz Protected Area in Hamadan Province, Iran

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ABSTRACT

Khan-Gormaz protected area with an area of 5000 ha, is located in west of Iran (south Hamadan province), between 34º35′ and 34º40′ northern latitudes and 48º10′ and 48º15′ eastern longitudes, with an altitude ranging from 1580 to 2853 m. The complicated topography and habitat heterogeneity, in addition to influencing the area by cold semi-arid climate at area and precipitation regime Mediterranean climate type caused formation of diverse vegetation types including herbaceous, grassland and meadows, cliff, shrub, tree and hydrophilic vegetation. This study carried out for determination and discrimination of vegetation type and flora vegetation by Eco-phytosociology method. Flora of this area was determined by using available references. Based on collection we encountered about 213 specimens that belonging to 164 genera and 45 families. The largest families in the area are Asteraceae (24 genera), Brassicaceae (17 genera), Lamiaceae (16 genera), Poaceae (15 genera) and Apiaceae (10 genera). The floristic composition of the area is strongly influenced by large number of Euro-Siberian (boreal) elements in the mesic parts and Irano-Turanian elements in the montane parts of the area. The life form spectrum was characterized according Raunkiers system. The life form spectrum observed was: Hemichryptophyte (48.07%), Therophyte (29.83%), Geophyte (9.94%), Chamaephyte (8.29%) and Phanerophyte (3.87%). The largest phytocory distribution species is Irano-Turanian (37.50%). © 2010 Friends Science Publishers

Key Words: Flora; Life form; Khan-Gormaz; Eco-phytosociology method; Type

INTRODUCTION

Iran with about 1.65 million square kilometer surface area is a large country and after Turkey is the richest country of plant diversity in the Middle East. The rich flora and fauna and unique landscapes of this land and its old civilization attracted many biologists and orientalists. This country is situated among three main phytochoria including Euro-Siberian (boreal), Irano-Turanian and Saharo-Sindian (White & Léonard, 1991) or Saharo-Arabian (Zohary, 1973; Akhani, 2007) and influenced by the introgression of Somalia-Masaei and Mediterranean species (Zohary, 1973; Takhtajan, 1986; Léonard, 1989).

The knowledge of the floristic composition of an area is a perquisite for any ecological and phytogeographical studies and conservation management activities. In studying any particular piece of vegetation from an ecological point of view, our first step must be to determine the facts as they exist on the ground: facts regarding the vegetation on the one hand; facts regarding the habitat on the other (Nicholes, 1930). If there is any one set of facts, which is more susceptible to direct study and exact characterization than any other, it is the floristic composition of the vegetation. Traditionally the designation of protected areas in Iran was largely based on fauna and in particular large mammals and birds, which are more attracted for hunters. Plant biodiversity and phytogeography are other important factors, which should be considered in evaluation of conservational value of an area. Due to relative few numbers of local floristic and ecological studies in Iranian protected areas, our knowledge about flora of Iran and conservation management based on floristic structure and the status and list of threatened species is far from completeness.

The diversity of plant life is an essential underpinning of most of our terrestrial ecosystems. Humans and most other animals are almost totally dependent on plants, directly or indirectly. Another important role of plant life is the provision of ecosystem services the protection of water sheds, stabilization of slopes, improvement of soils, moderation of climate and the provision of a habitat for much of our wild fauna. While it is generally accepted today that the conservation of all biodiversity should be our goal, understanding the natural distribution of plants (floristic studies) is central to conserving biodiversity and managing ecosystems for long-term viability and sustainability. Iran is a country with high diversity climate and topography, which leads to diversity in natural and biological resources.

To cite this paper: Yavari, A. and S.M. Shahgolzari, 2010. Floristic study of Khan-Gormaz protected area in hamadan province, Iran. *Int. J. Agric. Biol.,* 12: 271–275

Therefore for management in order to conservation of this diversity, prevention from destruction of habitats, determining the native and resistance species and endangered species and supporting them, recognition of medicine plants for proper use of them, floristic studies is necessary. This paper provides a floristic list of the vascular plants of Khan-Gormaz protected area. While this study is very useful for planning with refer to protection, reclamation and management of valuable species, present study was done in Khan-Gormaz area.

Khan-Gormaz protected area with 5000 hectares surface area is situated between 34º35′ and 34º40′ northern latitudes and 48º10′ and 48º15′ eastern longitudes with an altitude ranging from 1580 to 2853m on southern highlands of Hamadan Province (Fig. 1). Because of high diversity of wildlife and diverse habitats and landscapes, the area was designated as protected area in 2001. Diverse topography, deep inaccessible valleys, and vertical cliffs are among the fascinating landscapes and physical structures of the area. Formation of almost all of the high mountains of the area can be attributed geologically to Jurassic era. According to available data means annual precipitation and temperature of 400 mm and 9ºC, respectively have resulted in a semi-arid climate in the area (Malayeri & Atri, 2001). The objective of this study was to determine the vegetation in a protected area in Khan-Gormaz area in hamadan province of Iran.

MATERIALS AND METHODS

In this study the unit of study (endogenous milieu) in Eco-phytosociological method is used (Atri, 2007). Endogenous milieu (special station) in Eco-phytosociological method is an area of vegetation that is homogenous view point of Floristic-Ecologic. In vegetations study, Endogenous milieu determine by physiognomic-floristic-ecological criteria. Establishment of releves (sampling unit in phytosociology) was carried out randomly in each Endogenous milieu (special station) for floristic-ecologic data collecting. In this order, all ecologic-floristic data were collected of each special station. Plant specimen deposited in the herbarium, of Bu-Ali Sina University in Hamadan, Iran. After providing herbarium labels were identified using available literature (Rechinger, 1963-2005; Akhani, 1998-2005; Freitag, 1975; Bhattacharjee, 1982; Aedo *et al.*, 1998) and comparing with identical specimens in herbarium. The chorology of each species was determined using published data (Browicz, 1983-1996; Akhani 1998-2005).

Determining the life form was done by Raunchiers classification (Raunchier, 1934) and then floristic list of this area provided in Table I. The abbreviations used in the text and the floristic list is as follow: T: Therophyte, H: Hemicryptophyte, C: Chamaephyte, Ph: Phanerophyte, G: Geophyte, IT: Irano-Turanian, ES: Euro-Siberian, M: Mediterranean, K: Khazari, Z: Zagrosian, O: Omani, SS: Sahara-Sendia, Com: Cosmopolite.

RESULTS

Flora: In this study a total of 213 species of vascular plants has been identified from Khan-Gormaz protected area, which belongs to 45 families and 164 genera (Table I). The biggest plant family of the area is Asteraceae (24 genera), Brassicaceae (17 genera), Lamiaceae (16 genera), Poaceae (15 genera) and Apiaceae (10 genera).

Vegetation: Because of diverse habitats and also different governing climatic systems in Khan-Gormaz several types of vegetation have been formed. The main forms of vegetation types are grassland and meadows, cliff, shrub, tree and hydrophilic vegetation (Table II). The life form spectrum of plant species is as follow: Hemichryptophyte (48.07%), Therophyte (29.83%), Geophyte (9.94%), Chamaephyte (8.29%) and Phanerophyte (3.87%) (Fig. 2).

Fig. 1: Topographic map of Khan-gormaz protected area showing position of the area in Iran

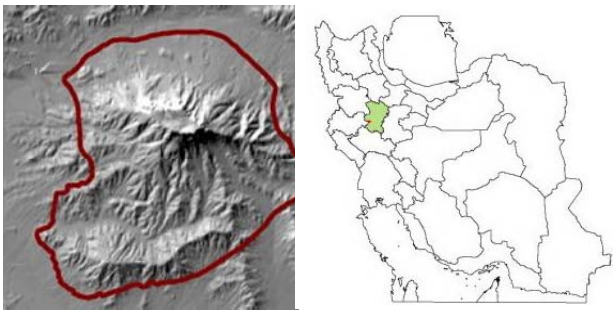

Fig. 2: The pie chart of life form of species Khan-Gormaz

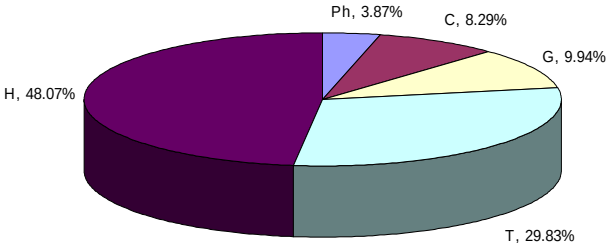

Fig. 3: The pie Chart of percentage of phytocorya of species Khan-Gormaz

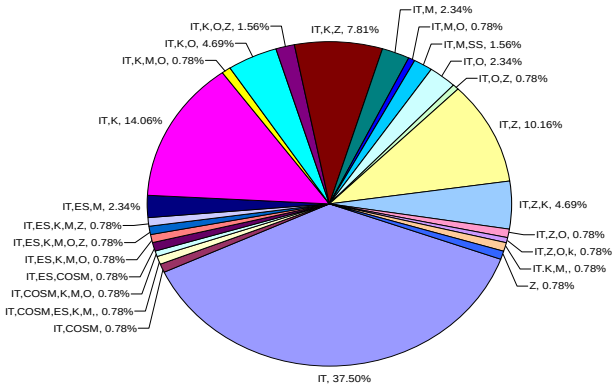

Table I: Floristic list of Khan-Gormaz

scientific name	life form	Iran endemic	medicinal use
Alliaceae			
Allium scabriscapum Boiss. & Ky.	G		
Amaryllidaceae:			
Ixiolirion tataricum (Pall.) Herb.	G		*
Apiaceae*:*			
Bunium caroides (Boiss.) Hausskn. ex Bornm.	G		
Bunium, rectangulum Boiss. & Hausskn.	G		
Chaerophyllum macropodum Boiss.	H		
Eryngium billardieri F. Delaroche	H		*
Ferula ovina (Boiss.) Boiss.	H		
Malabaila porphyrodiscus Stapf & Wettst.	T	*	
Prangos uloptera DC.	H		
Scaligeria nodosa (Boiss.) Boiss.	G	*	
Scandix stellata Banks & Soland.	T		
Smyrnium cordifolium Boiss.	H		*
Turgenia latfolia (L.) Hoffm.	T		
Aristolochiaceae *:*			
Aristolochia bottae Jaub. & Spach	H		
Asteraceae			
Achillea millefolium L.	H		
Achillea wilhelmsii C. Koch	H		*
Acroptilon repens (L.) DC.	H		
Anthemis odontostephana Boiss. var. odontostephana.	T		*
Carthamus oxyacantha M. B.	T		
Centaurea iberica Trev. ex Spreng.	H		
Centaurea leuzeoides (Jaub. & Spach) Walp.	H		
Centaurea solstitialis L.	H		*
Centaurea virgata Lam.	H		
Cephalorrhynchus rechingerianus Tuisl.	G		
Chardinia orientalis (L.) O. Kuntze	T		
Chondrilla juncea L.	H		
Cichorium intybus L.	H		
Cousinia hamadansis Rech. f.	H		
Crepis sancta (L.) Babcock subsp. iranica Rech. f.	T		
Echinops orientalis Trautv.	H		
Garhadiolus angulosus Jaub. & Spach	T		*
Gundelia tournefortii L.	H		*
Helichrysum rubicundum (C. Koch) Bornm.	H		*
Lactuca serriola L.	H		*
Lasiopogon muscoides (Desf.) DC.	T		
Picnomon acarna (L.) Cass.	T		
Picris strigosa M. B.	H		
Pulicaria dysentrica (L.) Bernh.	H		
Scariola orientalis (Boiss.) Sojak	H		
Scorzonera calyculata Boiss.	H		
Senecio vernalis Waldst. & Kit.	T		
Tanacetum polycephalum Schultz – Bip.	H	*	
Berberidaceae*:*			
Berberis integerrima Bunge	P		*
Boraginaceae *:*			
Anchusa italica Retz	H		*
Asperugo procumbens L.	T		
Echium italicum L.	H		*
Onosma kotschyi Boiss.	H	*	
Rochelia disperma (L. f.) C. Koch	T		
Brassicaceae*:*			
Aethionema carneum (Banks & Soland.) B. Fedtsch	T		
Aethionema stenopterum Boiss.	H	*	
Alyssum lanigerum DC.	H		*
Alyssum meniocoides Boiss.	T		*
Alyssum minus (L.) Rothm.	T		*
Alyssum szowitsianum Fisch. & C. A. Mey.	T		*
Arabis nova Vill.	T		
Aubrieta parviflora Boiss.	H		
Capsella bursa-pastoris (L.) Medicus	T		
Cardaria draba (L.) Desv	H		*
Chalcanthus renifolius (Boiss. & Hohen.) Boiss.	G		
Clypeola aspera (Grauer) Turrill	T		
Clypeola jonthlaspi L.	T		
Conringia perfoliata (C. A. Mey.) Busch	T		

Table I: Continued

Descurainia sophia (L.) Webb & Berth	T		
Drabopsis verna C. Koch	T		
Goldbachia laevigata (M. B.) DC.	T		
Graellsia saxifragifolia (DC.) Boiss. subsp. saxifragifolia	H		
Moriera spinosa Boiss.	C		
Neslia apiculata Fisch., C. A. Mey. & Ave- Lall.	T		
Parlatoria rostrata Boiss.	T	*	
Thlaspi perfoliatum L.	T		
Caryophyllaceae *:*			
Acanthophyllum caespitosum Boiss.	C		
Cerastium inflatum Link ex Desf.	T		
Dianthus orientalis Adams in Weber & Mohr subsp. orientalis.	H		
Mesostemma kotschyanum (Fenzl in Boiss.) Vved. subsp. kotschyanum	H		
Minuartia hamata(Hausskn.) Mattf.	T		
Minuartia meyeri (Boiss.) Bornm.	T		
Silene albescens Boiss.	H	*	
Silene aucheriana Boiss.	H		
Silene chlorifolia Sm.	H		*
Silene conoidea L.	T		*
Vaccaria oxyodonta Boiss.	T		*
Chenopodiaceae *:*			
Noaea mucronata (Forsk.) Aschers.et Schweinf.	C		
Salsola kali L.	T		
Cistaceae *:*			
Helianthemum ledifolium (L.) Miller var. ledifolium.	T		
Colchicaceae *:*			
Colchicum speciosum Steven	G		
Convovulaceae *:*			
Convolvulus arvensis L.	T		
Crassulaceae *:*			
Rosularia sempervivum (M.B.) Berger	H		
Cyperaceae*:*			
Carex stenophylla Wahlenb.	H		
Cyperus longus L.	G		
Dipsacaceae *:*			
Pterocephalus canus Coult. ex DC.	H		
Euphorbiaceae*:*			
Pterocephalus canus Coult. ex DC.	H		
Euphorbia cheiradenia Boiss. & Hohen.	H		
Euphorbia macroclada Boiss.	H		*
Euphorbia szovitsii Fisch. & Mey.	T		
Gentianaceae*:*			
Centaurium erythrea Rafn.	H		
Geraniaceae*:*			
Biebersteinia multifida DC.	G		
Geranium tuberosum L.	G		
Hypercaceae*:*			
Hypericum perforatum L.	H		*
Hypericum scabrum L.	H		*
Iridaceae*:*			
Gladiolus atroviolaceus Boiss.	G		
Iris hymenospatha Mathew & Wendelbo	G		
Iris reticulata M. B.	G		
Juncaceae*:*			
Juncus inflexus L.	G		
Lamiaceae *:*			
Acinos graveolens (M. B.) Link.	T		
Ajuga chamaecistus Ging. ex Benth. subsp. chamaecistus	C	*	
Eremostachys macrophylla Montbr. & Auch.	H		
Lallemantia iberica (Stev.) Fisch. & C. A. Mey.	T		*
Lamium album L.	H		*
Lamium amplexicaule L. var. amplexicaule	T		
Marrubium cuneatum Russell	H		
Mentha longifolia (L.) Hudson	G		*
Nepeta straussii Hausskn. & Bornm.	T		*
Nepeta laxiflora Benth.	H	*	
Phlomis olivieri Benth.	H		
Phlomis persica Boiss.	H	*	
Prunella vulgaris L.	G		
Salvia ceratophylla L.	H		
Salvia multicaulis Vahl	H		*

Table I: Continued

Salvia reuterana Boiss.	H		
Salvia sclareopsis Bornm. ex Hedge	H	*	
Scutellaria pinnatifida A. Hamilt.	H		*
Stachys inflata Benth.	H		*
Stachys lavandulifolia Vahl	H		*
Stachys setifera C. A. Mey.	G		
Teucrium orientale L.	H		*
Teucrium polium L.	H		*
Thymus eriocalyx (Ronniger) Jalas	H		*
Thymus fallax Fisch. & C. A. Mey.	H		
Thymus kotschyanus Boiss. & Hohen.	H		*
Ziziphora capitata L.	T		
Ziziphora clinopodioides Lam. subsp. rigida (Boiss.) Rech. f.	H		*
Ziziphora tenuior L.	T		*
Liliaceae*:*			
Bellevalia glauca (Lindl.) Kunth	G		*
Gagea gageoides (Zucc.) Vved.	G		
Ornithogalum persicum Hausskn. ex Bornm.	G		
Tulipa montana Lindl. var. montana	G		
Linaceae*:*			
Linum album Boiss.	H		
Lythraceae*:*			
Lythrum salicaria L.	H		*
Malvaceae*:*			
Malva neglecta Wallr.	H		
Onagraceae*:*			
Epilobium hirsutum L.	H		
Orobanchaceae *:*			
Orobanche anatolica Boiss. & Reut.	Parasite		
Papaveraceae *:*			
Hypecoum pendulum L.	T		
Papaver argemone L.	T		*
Papilionaceae *:*			
Astragalus laguriformis Freyn	C		
Astragalus (Malacothrix) spachianus Boiss. & Buhse.	H	*	
Astragalus (Onobrychoidei) vegetus Bge.	H		
Glycyrrhiza glabra L.	H		
Lens orientalis (Boiss.) Hand.-Mzt.	T		*
Lotus corniculatus L.	T		*
Medicago radiata L.	T		*
Onobrychis melanotricha Boiss.	H	*	
Ononis spinosa L.	H		*
Sophora alopecuroides L.	H		
Trigonella disperma Bornm. ex Vassilcz.	H	*	
Trigonella monantha C. A. Mey.	T		
Plantaginaceae*:*			
Plantago major L.	H		*
Plumbaginaceae :			
Acantholimon olivieri (Jaub. & Spach) Boiss.	C		
Poaceae*:*			
Boissiera squarrosa (Banks & Soland.) Nevski	T		
Bromus danthoniae Trin.	T		
Bromus tectorum L.	T		
Bromus tomentellus Boiss.	H		
Cynodon dactylon (L.) Pers.	G		*
Dactylis glomerata L.	H		
Elymus tauri (Boiss. & Bal.) Melderis var. kosanini (Nab.) Assadi	H		
Eremopoa persica (Trin.) Roshev.	T		
Festuca ovina L.	H		
Heteranthelium piliferum (Banks & Soland.) Hochst.	T		
Hordeum bulbosum L.	G		
Melica jacquemontii Decne. ex Jacquem.	H		
Nardurus subulatus (Banks & Soland.) Bor	T		
Oryzopsis holciformis (M. B.) Hack.	H		
Poa bulbosa L.	G		
Poa trivialis L.	H		
Stipa barbata Desf.	H		
Taeniatherum crinitum (Schreb.) Nevski	T		
Polygonaceae *:*			
Polygonum polycnemoides Jaub. & Spach	T		
Primulaceae *:*			
Androsace maxima L.	T		

Table I: Continued

Ranunculaceae *:*			
Anemone biflora DC.	H		
Ceratocephala falcata (L) Pers.	T		
Ficaria kochi (Ledeb.) Iranshahr & Rech. f.	G		
Ranunculus arvensis L.	T		*
Thalictrum isopyroides C. A. Mey.	H		
Thalictrum minus L.	H		*
Thalictrum sultanabadense Stapf	H		
Rosaceae*:*			
Amygdalus haussknechtii (C. K. Schneider) Bornm.	P	*	*
Amygdalus lycioides Spach	P		*
Cerasus microcarpa (C.A.Mey.) Boiss. subsp. tortuosa (Boiss. & Hausskn.) Browicz	P		*
Crataegus meyeri Pojark.	P		*
Crataegus pseudoheterophylla Pojark.	P		
Potentilla reptans L.	H		*
Rosa canina L.	P		
Rosa elymaitica Boiss. & Hausskn.	P		
Rosa orientalis Dupont ex Ser.	P		
Rosa persica Michx. ex Juss.	C		
Sanguisorba minor Scop	H		*
Rubiaceae*:*			
Asperula glomerata (M. B.) Griseb.	H		
Callipeltis cucularia (L.) Rothm.	T		
Crucianella gilanica Trin.	H		
Cruciata taurica (Pallas ex Willd.) Ehrend.	H		
Galium kurdicum Boiss. & Hoh.	H		
Galium setaceum Lam.	T		
Galium verum L.	H		*
Scrophulariaceae:			
Verbascum speciosum Schrad.	H		*
Veronica anagallis-aquatica L.	H		
Veronica orientalis Miller	H		
Veronica triphyllos L.	T		*
Solanaceae*:*			
Hyoscyamus reticulatus L.	H		
Thymelaeaceae:			
Dendrostellera lessertii (Wikstr.) Van Tiegh.	C		
Urticaceae *:*			
Parietaria judaica L.	H		*
Urtica dioica L.	H		
Valerianaceae*:*			
Valeriana sisymbriifolia Vahl	G		
Valerianella cymbicarpa C. A. Mey.	T		
Valerianella uncinata (M. B.) Dufr.	T		
Violaceae *:*			
Viola modesta Fenzl	T		

Phytogeography: Khan-Gormaz protected area is geographically located main phytogeographic Irano-Turanian region. A considerable number of species (37.50%) belongs to Irano-Turanian region (Fig. 3).

DISCUSSION

It is concluded from the results of the study that the study area is very rich with refer to plant diversity. Among all plants Hemichryptophyte with 48.07% is dominant and Therophyte with 29.83% is in the next order. In facts life forms of the plants indicate the possibility of adaptation of plants to environmental factors especially climatic condition. According to Mobayen (1980-1996) the frequency of Therophyte plants is due to Mediterranean climate and the frequency of Hemichryptophyte is due to cold and temperate climate. On the whole, the frequency of the Hemichryptophyte and Therophyte among the plants of the area shows that the effect from two types of climate-Maditerranean and cold temperate affected them.

Table II: Vegetation type

Crag	Hydrophilic	Cliff	Tree	Shrub	Herbuseous
Ephedra	*Phragmites*	*Parietaria*	*Berberis*	*Cerasus - Rosa*	*Astragalus*
	Juncus		*Crataegus*	*Amygdalus*	*Astragalus - Acantholimon*
	Mentha				*Astragalus – Stipa*
					Acanthophyllum
					Arrhenatherum
					Bromus
					Dianthus
					Eryngium
					Euphorbia
					Ferula
					Festuca
					Silene
					Thymus
					Tulipa – Allium

Therophyte adapted to the dryness of the region and shortage rainfall, because these plants spend vegetative period in the form of seed (Asri, 2003). Hemicryptophyte adapted to condition of area. They adapted and developed themselves to area by using different ways such as: reserving water, using ground water, reducing their water need by loosing their leaves and reduction of vegetative growth. Dominance of Hemicryptophyte and Therophyte clearly indicate the adaptation of these plants to aridity of area.

The phytocorya distribution of plants reflects the climate conditions. Considering to this fact that 37.50% plant species in this area are Irano-Touranian elements, so we can conclude that this area belongs to Irano-Touranian (the Irano-Touranian is characterized by low rainfall & a long dry season). The existence of Asteraceae family with large diversity is the result of destruction in this area. It is understood that the increasing of the number of some plant families including Asteraceae accompanied with destruction in area, following studies support the mentioned fact (Archibold, 1995; Vakili Shahrebabaki *et al.,* 2001).

Significantly the presence of these species: *Stachys inflata*, *Teucrium polium*, *Teucrium orientale, Phlomis olivieri* and *Euphorbia* sp. are indication of destruction in no protected portions of this area according to rich biodiversity of study area, which resulted from floristic study, it is quiet possible to concentrate the improving practices and reclamation to area again. About 60 medicinal species were determined in this area that was shown in Table I. Some of most important species area as follows: *Thymus* kotschyamus*, Ziziphora clinopodioides*, *Stachys inflata*, *Stachys lavandulifolia*. The number of endemic species of Iran in this region is 15, which were shown in Table I. The presence of high biodiversity, beautiful Bahrami and Lorestani caves and springs, eye-catching landscape of Takht Sar cave and migratory birds, have encouraged research, educational and tourist activities in the region.

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(Received 29 July 2009; Accepted 24 September 2009)