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Biodiversities and limiting factors of Lashgardar Protected Area (LPA), Hamadan Province, Iran

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ABSTRACT

Reyahi-Khoram M, Norisharikabad V (2011) Biodiversities and limiting factors of Lashgardar Protected Area (LPA), Hamadan Province, Iran. Biodiversitas 12: 216-221. Lashgardar Protected Area (LPA) located in Hamadan Province in Iran, it is a mountainous and plain area and proximal to Malayer Township. In 1991, the region was known as a protected area for increasing wild animals' population. This research has been conducted during 2001 through 2009. Plant and animal species of the region were identified and statistics of the population of animal flagship species were gathered. In this research, valid academic resources were used for identification of animal and plant species. Geographic Information System (GIS) has been used to evaluate the land as main tool. The software used was Arc View (version 3.2a) scale was 1/50,000. Due to cold mountainous climate, the region is covered by a wide diversity of trees, shrubs, grasses and herbs. There were 18 species of mammals as well as 75 bird species in LPA. Most abundant mammalian population belongs to wild sheep (558 animals) and the second abundance was related to wild goat (515 animals). Also, the most abundant bird species belong to ortolans. Result of the present study showed that construction of connection roads in vicinity the region, establishment of factories inside and around the region, military garrison, unauthorized grazing, unlawful hunting, and Ahangaran mine and rail road have all exposed put LPA to serious threat and danger.

Key words: biodiversity, environment, Lashgardar, protected area, wildlife.

INTRODUCTION

At the onset of life on the earth, land was covered with various plant and animal species and consequently full of natural resources, which had always been exposed to transformations due to geological evolutions and climatic changes. Such changes happened very quickly sometimes, but occurred much slowly at most times. Although as regards quality and quantity, these changes could never be compared to the changes Made by Human Hands. The human power is regarded as a very powerful factor in changing the living conditions of plants and animals, which has led to destruction of habitats and deterioration of genetic resources. Hasty measures and interferences of human in the habitats have led to reduction of species, extinction of a remarkable diversity of species, and loss of biodiversity. Therefore, those concerned with environment issues have considered strategies on international level so as to protect the biodiversity. A protected area is an area, which has been determined specifically for protection and maintenance of its biodiversity, natural and cultural resources, and is protected and controlled through legal measures or common traditional methods. In fact, protected areas are the manifests of creation and their protection is the fundamental basis for activities of environmentalists (Najmizadeh and Yavari 2006).

Protection of biodiversity and genetic Diversity could reliably support the goals of development. Today's, the process of destruction of habitats has outrivaled restoration and reconstruction. Extinction of species in all growth ecosystems has had a soaring increase and once the scientists do not investigate and solve this crisis, within a short time it would threaten the life of many plant and animal species.

Today, biodiversity is prone to threat even in protected areas. Destruction of habitats and their turning into islands has put long-term protection of many protected habitats in dilemma. Wildlife habitats are areas in which undomesticated species of plant or animal could find their food, water and shelter needs and other required necessities for survival. It is estimated that 5000 species of mammals, 10000 species of birds, 8000 species of reptiles, 5500 species of amphibious and 27000 species of fishes or aquatics exist throughout the world (Nunes-Paulo et al. 2003). A recent study in Iran has shown that Iran with about 1.65 million square kilometer surface area is a large country and after Turkey is the richest country in 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 (Jafari and Akhani 2008).The climatic diversity of Iran has resulted in the growth of 7576 plant species, the occurrence of 517 bird species, 208 reptile species, 170 fish species, 164

mammal species and 22 amphibians (Reyahi-Khoram et al., 2010a,b). The general acceptance of the concept of protected areas in Iran and the necessity to allocate areas to them which was materialized by the foundation of three national parks and 15 protected areas in 1967 is considered a turning point in the history of the environmental protection in Iran. Continuous increase in the number, area and diversity of the protected areas over the last 40 year documented protection history of Iran indicated public awareness and will to protect biological resources and reserves. Designation of 160 protected areas of the total area of 11824599 hectares until 2006 covering 7.17 percent of the entire country area indicates an annual increase rate of 4.2 areas and 311174 hectares (Darvishsefat 2006). LPA being Located in Hamadan Province, it is a mountainous and plain area and proximity to population centers as Malayer Township have facilitated educational, research and tourist activities in the region. Malayer is one of the cities of Hamadan province in west of Iran.

With expansion of environmental Knowledge and valuable activities of Non governmental Organization (NGO), the necessity of protection of plant and animal habitats and the areas under management of Department of Environment (DoE) with the aim of developing ecotourism, biodiversity, and research and educational affairs becomes more clear every day so that everyone understands its importance. In the ecosystems of arid and semi-arid regions, as Iran, the issue of protection becomes more important because the ecosystems are fragile.

MATERIALS AND METHODS

This research has been conducted during 2001 through 2009. Documentary and observation methods have been used to access to information. This means that identifying biodiversities and limitations of the LPA was made during the research years through extensive field inspections and direct field observations. Plant and animal species of the region were identified and statistics of the population of animal flagship species were gathered. In this research, valid academic resources were used for identification of animal and plant species (Mansoori 2001; Ziaie 2008).

To identify and define ecologic resources of the region, digital maps were used and on this basis the topology situations as well as ground cover of studied area have been accomplished. In addition, Geographic Information System (GIS), Remote sensing tools and technology were used in determining any changes in this study area and evaluate the land. The software used was Arc View (version 3.2a) with the Universal Transverse Mercator (UTM) projection and scale was 1/50,000.

RESULTS AND DISCUSSION

General status of the region

LPA with 24,000 hectares surface area is situated between 34º,09',00" and 34º,20',00" northern latitudes and between 48º,51',30" and 49º,02',00"eastern longitudes, on northern highlands of Malayer Township in Hamadan Province. "Koh Sardeh" Mountain with a height of 2858 meters from sea level is in northern part of the region. The rocks of this mountain are the main habitat of wild goats (*Capra aegagrus*). Also dune-bedded parts of this region are known to be the main habitat of wild sheep (*Ovis orientalis*). Ahangaran Mountain with altitude of 2758 m is in the southeastern part of the region (Figure 1). This is a high rocky mountain with several valleys, appropriate ground cover and sufficient expansion, which has created suitable conditions for survival of flagship species. Based on the initial investigations made by the experts of DoE in October 1984, this region was officially declared as a prohibited hunting area for five years. For the second time in 1989, this region was officially announced as a prohibited hunting area for another three years. Finally, in 1991, the region was known as a protected area for increasing wild animals' population. In order to manage and control of LPA, two units ranger's station (Police Station) located in the western area and north area of the region are fully controlling and supervising the region by several facility and with full equipment.

Because of the type of land application, plain regions of the studied area are suitable mainly for agricultural activities and pasture management. The rocky areas with sleep slopes, cliffs, caves, deep valleys are suitable for reproduction of different species of wild animals and passing the winter season. High mountains cause snow precipitation, which in turn is very effective to recharge the underground water table. In reciprocal interaction, soil and ground cover help survival and stability of ecosystem.

The studied area has average water resources. This means that the water need of different animal and plant species are supplied through permanent and seasonal water springs. This region has 11 permanent springs of which; only five springs have been sanitized and improved. There is not any permanent river in LPA. The only seasonal river of this region is Jozan-Aznaveleh, which is rooted in Gomasab Babolghani Mountains and joins Haramabad River after passing through the region. Because it is a seasonal river, no aquatic lives in it and no aquatic bird can make nest there. Regarding the situation of springs, the wild sheep have easy access to water. Also, some springs such as Ozon Dareh flow from the heights to near the plain regions. LPA is a mountainous area, minimum altitude of 1750 meters in plain regions and maximum altitude of 2858 meters in Koh Sardeh Mountains.

According to statistics of meteorological stations, maximum ambient temperature in summer is 36.8ºc in July, while the minimum is 6.5ºc below zero in January. The amount of annual precipitation is different from 250 millimeters in plain regions to 320 millimeters in the heights. Most of the precipitations occurred in the form of snow in cold months of the year. Average relative humidity of the area is 28% in the hottest month (July) and 70% in the most humid month (March).

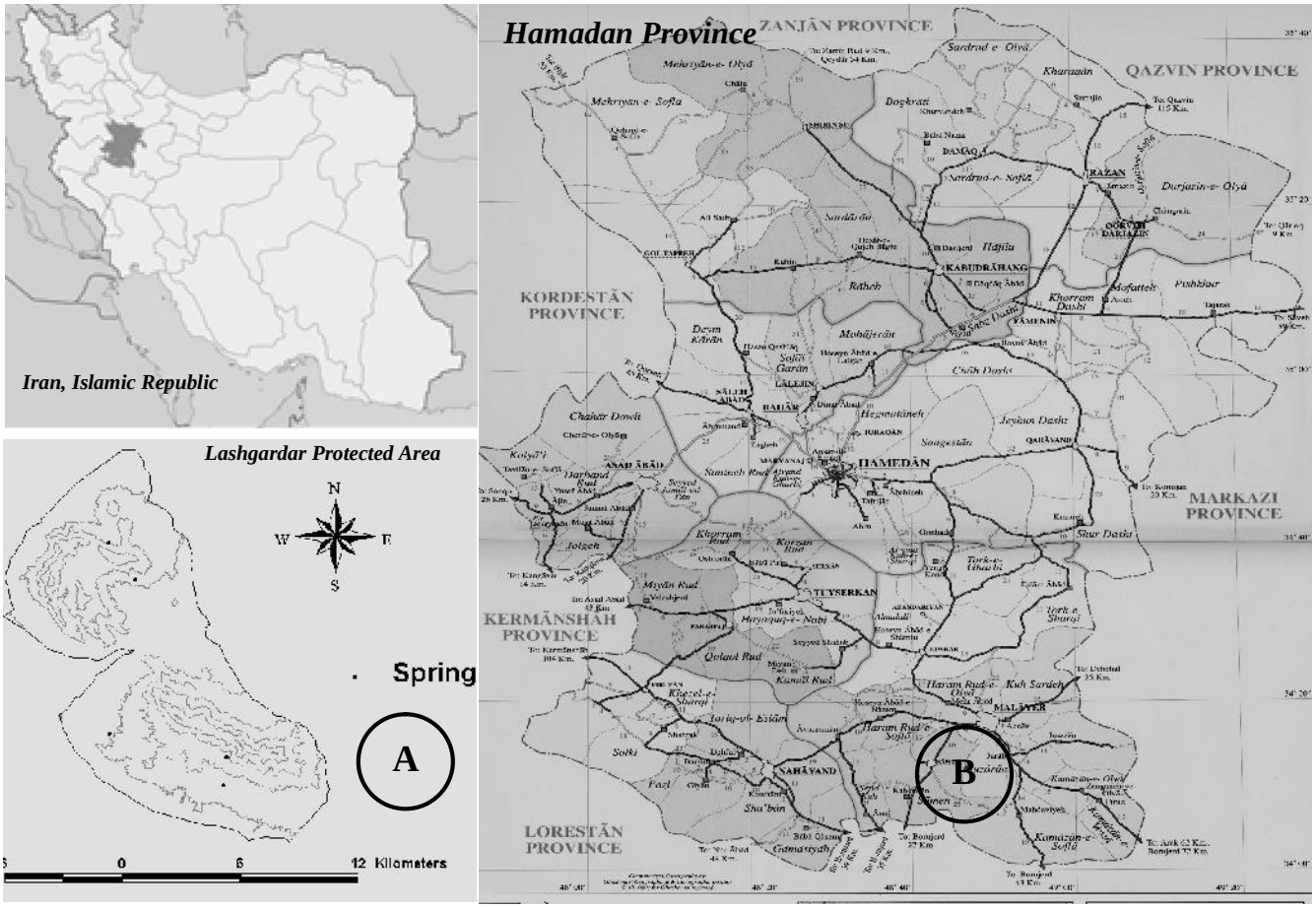

Figure 1. General status of Lashgardar Protected Area (A) in Hamadan Province (B).

Wind direction is south-north in this region. Also the ground level of these regions is covered with rock land, which is in turn influenced by wind blow, i.e. due to wind blow the soil surface layer undergoes corrosion and will find no chance for improvement. In the winter due to high wind speed, wild animals are mostly seen in the lowest part of the region. But in summer, the animals choose the southern rocky part of the region which is a leeward part as their daylong sleeping and grazing.

Unfortunately no watershed management project has been implemented in the region. Therefore a small amount of water from precipitations infiltrate to land, and land is quite dry in the heights. As a result of this, wild animals of Koh Sardeh Region, which are mainly wild goats, suffer from severe shortage of water in the summer.

There are 16 villages around the region. All villages are located in the border area of the region. The main business of these villagers is related to farming, gardening and animal husbandry. Whereas the villages' population has increased in recent years and the villages' economy is based on farming, gardening and animal husbandry and whereas there are a few free zones for animal grazing around the region, LPA suffer from animal grazing pressure.

Ahangaran lead and iron mine is in the eastern side of Ahangaran Mountains inside LPA. This mine was exploited in 1960 for extraction of lead. Lead extraction from the depth of ground, tunnel excavation operations and soil withdraw created insecurity in the region. Therefore if a better method is used for extraction, its business is coordinated with the issue of protection. There is a garrison in the northeast part of the region. This place has been transferred to the army by the city's endowment department without coordination with DoE. Ozamen spring in the north of garrison is the main drinking pond for wild animals, which can hardly have access to it due to insecurity.

Regarding implementation of national and regional development programs in recent years, the need for establishment and expansion of connecting roads, railroads, electricity and gas supply lines have increased. These communication roads are mainly concentrated in the surrounding border area of the region.

Plant coverage of the region

LPA has different plants so that most plant reserves of Hamadan Province could be seen in this area. Based on the recent study that was accomplished in LPA, it was reported that, 43 families, 184 genera and 266 plant species are existed in LPA, almost 28 species of which are endemic of Iran (Safikhani et al. 2003). The most important medicinal plant species of LPA are: *Gundelia tournefortii* L.,

Carthamus tinctorius L., *Rheum acuminatum*, *Ziziphora capitata* L., *Glycyrrhiza glabra* L., *Plantago major* L., *Mentha longifolia* (L). Hadson and *Malva sylvestris* L. Due to cold mountainous climate, the region is covered by a wide diversity of trees, shrubs, grasses and herbs. But there is no forest area, shrub species are sporadically seen in the heights of the region and the most important shrub species of LPA are: *Crataegus meyeri* A. Pojark, *Berberis integerrima* Bunge and *Amygdalus lycioides* Spach. The most important tree species of LPA are *Ficus carica*, *Pistacia atlantica* Desf. and *Rhus coriaria* L. The most important of herb and grass species of LPA are: *Acantholimon olivieri* (Jaub. & Spach) Boiss, *Phlomis olivieri* Benth, *Achillea wilhelmsii* C. Koch., *Cicer oxyodon* Boiss. & Hohen, *Atraphaxis spinosa* L., *Zataria multiflora*, *Peganum harmala* L, *Echinops pungens* Trautv, *Fritillaria imperialis* L., *Rheum ribes* L. and *Hypericum perforatum* L.

Wildlife of the region

There are 16 species of mammals from 11 families and 4 orders as well as 75 bird species from 23 families and 6 orders in LPA. The most mammal population belongs to wild sheep (*Ovis orientalis*) (558 animals) and the second abundance is related to wild goat (*Capra aegagrus*) (515 animals). Also, the most bird family belongs to Turdidae.

Mammals

Due to the form of hoof and inability in escaping from carnivores, wild goat (*Capra aegagrus*) is not interested in living in plain regions. It chooses its living place in mountainous and rocky places, and high lands with rocky partitions. The breeding season takes place in December. The lambs, usually two, are born in late May or June. This animal is territorial and protects its mating place. Among other characteristics of wild goat is that it does not migrate but lives as a native animal in the region. This behavior, beside the situation of ecological island of the area, i.e. its complete surrounding by human societies and expansion of agricultural, industrial and urban installations, has led to genetic equalization and jeopardizing this specie in the long term.

Wild sheep such as Armenian sheep (*Ovis orientalis gmelini*) and Esfahan sheep (*Ovis orientalis isphahanica*) too exist in western areas of the country. In LPA, the differences observed in the morphology of existing population indicate presence of hybrid species in the region; a white spot is seen in the waist of this specie, and these wild sheep are called "Allakamar", which by words means white-waist. Females are smaller than males and have short slightly curved horns. Due to natural behavioral characteristics and migration to Markazi province from the east of the region on one side, and migration to Nashr prohibited hunting area in Hamadan province and finally Ghazvin province, although this specie is subject to numerous hazards related to migration route.

On the other side, regarding the diversity of mammals, carnivores such as wolf (*Canis lupus*), Common fox (*Vulpes vulpes*), golden jackal (*Canis aureus*) and Striped Hyena (*Hyaena hyaena*) could be seen in the region. Daily and seasonal migrations of mammals play an important role in their settlement in the region and they exist almost everywhere in the region. Other mammals with sufficient population as Afghan Pika (*Ochotona rufescens*), Wild Boar (*Sus Scrofa*), Indian crested porcupine (*Hystrix indica*), Cape hare (*Lepus capensis*) and Yellow Ground Squirrel (*Spermophilus fulvus*) specie live in the region. Figure 2 and 3 summarize the distribution of mammal orders and species in the studied area.

Due to regular and efficient protection so far, the process of growth of two important species of the region, including wild goat and wild sheep indicates favorite growth of population of these species in recent years so that the total population of wild goat reached from 117 animals in 1999 to 515 animals in 2009. Wild sheep population reached from 127 animals in 1999 to 558 animals at the end of 2009 year. The populations growths related to wild sheep and wiled goat are shown in Figure 4. Optimum increase of population has led to issuance of hunting permit of these species to respond to the demands of the hunters in the region so that in 2003, 22 special permits were issued (15 for wild sheep and 7 for wild goat) and in 2009, 15 permits including 10 permits for wild sheep and 5 permits for wild goat were issued. Certainly substantial habitat characteristics as the most important factors have played their role in improvement of biotic conditions.

Birds

With varied plain, foothill and mountainous ecosystems and also an intact pasture and shrub coverage, beside fruit orchards close to the region, LPA has managed to successfully play its role as a suitable habitat for different family of birds. The most bird population is related to Turdidae family and the highest percent of abundance is related to Passeriformes order (69%) including Alaudidae, Motacillidae, Laniidae, Turdidae, Sylviidae, Sittidae, Emberizidae, Fringillidae, Ploceidae, Sturnidae and Corvidae families. After this, Falconiformes order with 11% presence and finally Caprimulgiformes order with 1% has minimum abundance of LPA. Figure 5 summarizes the distribution of bird orders and families in the studied area.

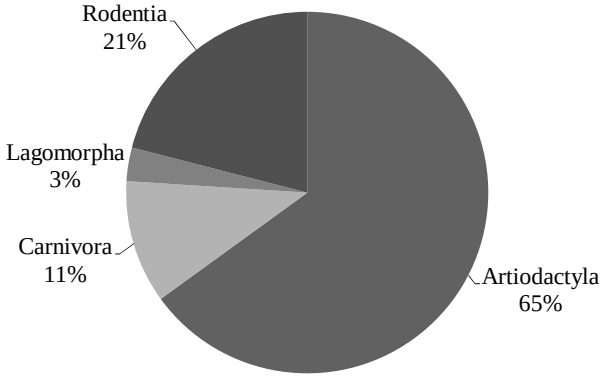

Figure 2. Classification of mammal orders in LPA of the year 2009

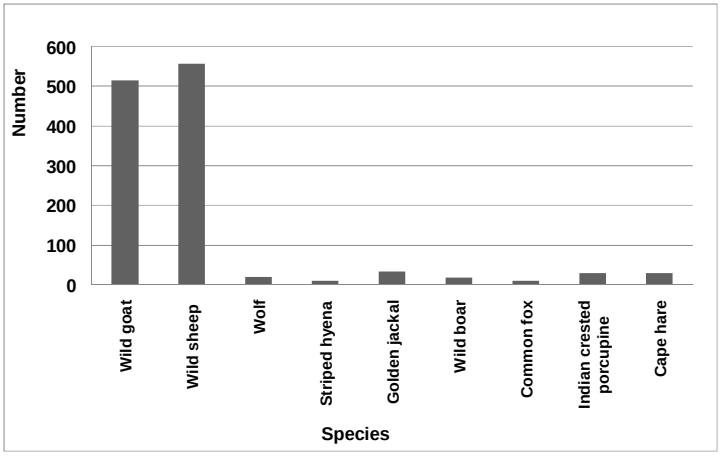

Figure 3. The species of mammals in the LPA of the year 2009

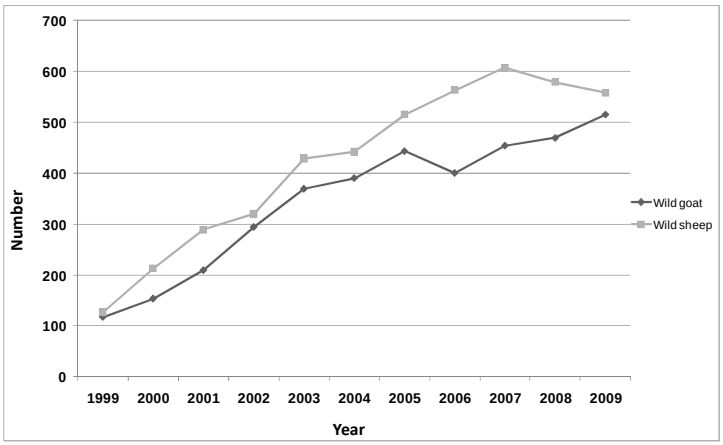

Figure 4. The trend of population growth related to wild goat and wild sheep in LPA

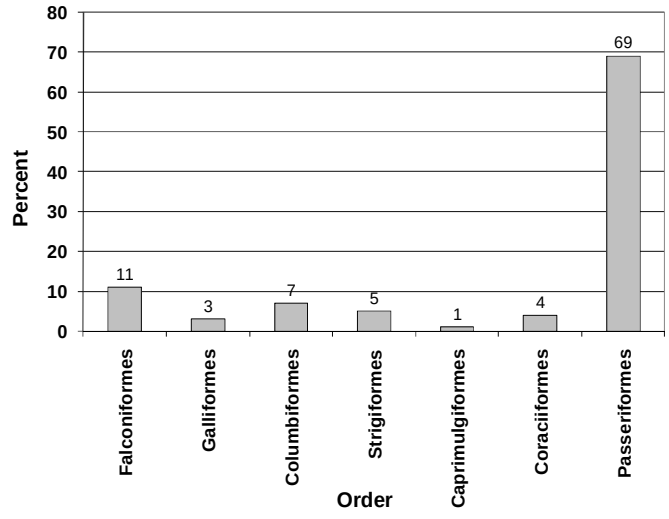

Figure 5. Classification of birds orders in LPA of the year 2009

Discussion

The present results showed that LPA, as a natural environment it has a diversity and expansion of different plant and animal species and in fact, it is necessary to protect this region as an animal and plant habitat. In addition, LPA has many appropriate industrial and economic development capabilities, but as a natural environment it has a diversity of plant and animal species. Field observations and studies showed that construction of connection roads in vicinity the region, establishment of factories inside and around the region, military garrison, unauthorized grazing, unlawful hunting, and Ahangaran mine and rail road have all put LPA in serious threat and danger. Therefore it is extremely necessary that LPA management intensify its protective and security measures with full alertness for survival of wildlife of the region. A few management studies that have been carried out have focused on the improvement of management and environmental education activities in protected areas (Xu J. et al. 2006); (Geneletti and Iris 2008). Meliadis et al. (2010) reported that current technologies can be used for modeling environmental parameters which improve our knowledge of the attributes, characteristics, situation, trends, and changes of natural ecosystems in the protected area.

It is also quite necessary to take appropriate measures and make useful interference in the said LPA in order to improve and stabilize the existing conditions. It is obvious that the suggested interfering measures are provisional, which are aimed at stabilizing and improving the existing conditions; otherwise man has no right to interfere in natural characteristics of the region.

The obtained results showed that in this region water resources are mainly permanent and seasonal springs and no water shortage is seen in most times of the year. But watershed management studies and implementation of watershed projects will result in controlling water and soil corrosion and maintenance. Due to the existence of rocky areas with sleep slopes, cliffs in the rocks, deep valleys and dune-bedded areas with different valleys, this region has provided suitable conditions for reproduction and passing winter season of different species of wildlife.

LPA has a diversity of mountainous plants and because of cold weather, it has a rich coverage of shrubs and grasses in the heights and pasture plants in dune-bedded hills. Therefore the region's animal has no special critical problem regarding forage and food. Also with regard to construction of two units ranger's House in the said region and by employing experienced rangers, the region's security coefficient increases too, although some shortages could also be seen in these areas.

CONCLUSION

These results, and previous studies, indicated that expansion of road lines, highways and railroads around the region created problems related to migration routes of the wild animals of the region by hindering the genetic transfer from one generation to the other. The author sure that this factor can prevents the genetic diversity which in turn is responsible for species diversity, because the wild animals in free zones and in LPA have little chance of migration due to permanent traffic of vehicles. In the meantime wild animals need in-migrations and out-migrations with free habitants in order to pass winter season, reproduction and other habitat needs. It has been observed that species like cape hare (*Lepus capensis*), golden jackal (*Canis aureus*) and Striped Hyena (*Hyaena hyaena*) clash with vehicles when they are migrating and die. Permanent traffic of vehicles in these roads has its influences on wildlife restriction due to creating insecurity.

RECOMMENDATIONS

Because of migrations the wildlife, it is recommended that the migration route related to wildlife be organized to studying and designing roads and it is necessary to attend the construct of underpass for wildlife migration. Since management of the LPA is very important, it is highly recommended that consultant of LPA plan should accelerate to complete and approve the guideline for the preparation of management plans for LPA. From a practical perspective, authorities may consider controlling drought and preparing the region's watershed management plan and implementing necessary mechanical and biomechanical installations as well as management strategies in a timely manner. It is recommended that the authorities consider providing sufficient credit to identify, determine the parcel national lands and people-owned lands of studied area and purchase un-national lands and obtain legal document for all lands in the entire region. Since carrying capacity studying is very important related to environmental management, it is suggested that the authorities consider identify the carrying capability of LPA and determining the number of wild animals and their reproduction in the near future.

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