

## Survival of the Persian leopard (*Panthera pardus saxicolor*) in Iran: Primary threats and human-leopard conflicts

AREZOO SANEI<sup>1\*</sup> and MOHAMED ZAKARIA<sup>2</sup>

The frequencies of primary threats in previously identified Persian leopard (*Panthera pardus saxicolor* Pocock 1927) distribution range in Iran were estimated in this study conducted from 2002 to 2006 using interviews with local settlements and shepherds, hunters and rangers of the Iran Department of Environment (DoE). Habitat assessments were done to investigate prey availability, presence of human disturbance factors and presence of livestock as well as habitat suitability. Secondary data on human/livestock-leopard conflicts were obtained from records covering two years (2002-2003). The study showed that habitat disturbances followed by illegal hunting and excess of livestock are the main potential threats to the populations of Persian leopard in Iran. Most of the complaints made by local settlements in 2002-2003 were primarily regarding wolf (*Canis lupus*) infestation while Persian leopard was in the mere third and second level of complaints in 2002-2003, respectively. This study recommends that local awareness programs must be conducted particularly in the conflict regions reported in this study. These information-education programs could contribute to the decrease in leopard hunting and prey poaching hence, would substantially help the local settlements in successful management of their livestock industry.

**Key words:** *Panthera pardus saxicolor*, Persian leopard, threats, human-leopard conflicts, distribution range, Iran

---

<sup>1</sup>Asian Leopard Specialist Society, Tehran, Iran. e-mail: arezoo.saneii@leopardspecialists.com & arezoo.sanei@gmail.com Website: www.leopardspecialists.com

<sup>2</sup>Department of Forest Management, Faculty of Forestry, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor Darul Ehsan, Malaysia. e-mail:mzakaria@putra.upm.edu.my

\*Corresponding author: Asian Leopard Specialist Society, Tehran, Iran.  
e-mail: arezoo.saneii@leopardspecialists.com & arezoo.sanei@gmail.com  
Website: www.leopardspecialists.com

## INTRODUCTION

The Persian leopard (*Panthera pardus saxicolor* Pocock 1927) has a wide distribution in the Middle East while the main population is known to be existed in Iran (Kiabi *et al.* 2002, Khorozyan *et al.* 2005, Sanei 2007). Leopard is considered as a protected species in Iran's wildlife conservation law. After extinction of the Persian lion (*Panthera leo persica*) and Caspian tiger (*Panthera tigris virgata*), the Persian leopard is the last member of the genus *Panthera* that remains in Iran.

Various studies indicated that the species is susceptible to survive in human dominated habitats (Edgaonkar & Chellam 1998, Athreya *et al.* 2007, Sanei *et al.* 2011). However, being resistant to human pressure does not imply that a viable population is existed in the region (Hunter *et al.* 2003).

Khorozyan *et al.* (2008) revealed that poaching, plant gathering, deforestation and human caused wild fires are threatening the Persian leopard population in Armenia. Although extinction of the species is strongly related to the destruction and fragmentations of its habitat (Nowell *et al.* 2006), the quality of natural environment in Iran is being degraded at a high rate (World Bank 2005). Generally habitat destructions caused by logging and plantation activities result in new communities with different types of population interactions. As a result of subdividing habitats to smaller fragmented patches, both the contiguity and area of the available habitat will decrease (Anderson 1999). Particularly in the case of wide-ranging wild cats with requirement of large habitats of good quality, space limitations would reduce their viability (Sunquist & Sunquist 2001, Khorozyan *et al.* 2010). In addition, reducing actual size of the habitat following by farming, housing and construction activities may increase the edges compare to the area of the habitat. Edge effects arising from these projects can negatively affect behavior of large carnivores (Ngoprasert *et al.* 2007).

Uncertain reproduction status, modified by the sex and age structure of population, and genetic depression following by successive inbreeding are some of the consequences of habitat fragmentation. Moreover, when population is small it may be extinct by a random probability because population survival would rely on response of each individual to variation in environmental factors (Sinclair *et al.* 2006). Conducting farming operations would result in eliminating specialized species and encourage generalist ones and this would have substantial impact on predator prey interactions (Anderson 1999). Commercial exploitation of leopards and their preys, trophy hunting, planned or accidental killings outside protected areas (Joshi 2010, Balme & Hunter 2004) have further threatened the species.

This study was conducted to bring an understanding to the primary threats that are affecting the current populations of leopard in various provinces of Iran. Data collection was started in 2002 and completed in December 2006. The study was conducted concurrently with leopard distribution studies throughout the leopard distribution range in the country. Seventy four protected and non-protected areas reported by Sanei and Zakaria (2011) as the leopard distribution range in Iran have been studied to identify the main threat factors to the leopard survival in these areas. These include mountainous chains of Alborz and Zagros, Hyrcanian forests along

## Threats to Persian leopard in Iran

the Caspian Sea and hills and mountains in central and south of Iran. Therefore, climatic factors are very variable in various regions. Sanei and Zakaria (2011) revealed that temperature in leopard distribution range may vary from -23.10 to +49.40°C. Moreover, while the southeastern region may experience a dry condition, the average rainfall in the north could be more than 1,200 mm per year.

The names and locations of study sites are listed in Table 1. Figure 1 shows the leopard distribution range in Iran and the various levels of dry condition in the leopard range in recent years.

Table 1. Leopard distribution range in Iran (*i.e.* study sites) as reported by Sanei and Zakaria (2011, this issue).

No.	Site Name	No.	Site Name	No.	Site Name
1	Ab-bar <sup>12</sup>	27	Iranshahr <sup>25</sup>	53	Parvar <sup>10</sup>
2	Amol <sup>2</sup>	28	Izeh <sup>13</sup>	54	Pol-e-Sefid <sup>2</sup>
3	Arasbaran <sup>4</sup>	29	Jahan nama <sup>14</sup>	55	Qamishlou <sup>21</sup>
4	Avaj <sup>6</sup>	30	Jajroud <sup>3</sup>	56	Rochun <sup>18</sup>
5	Azna <sup>7</sup>	31	Kamyaran <sup>19</sup>	57	Sabz Kuh <sup>24</sup>
6	Bam <sup>8</sup>	32	Kavir <sup>10</sup>	58	Salook <sup>1</sup>
7	Bamoo <sup>9</sup>	33	Khabr <sup>18</sup>	59	Sarani <sup>1</sup>
8	Biarjmand <sup>10</sup>	34	Khalkhal <sup>20</sup>	60	Saravan <sup>25</sup>
9	Bisotun <sup>11</sup>	35	Khansar <sup>21</sup>	61	Sari <sup>2</sup>
10	Boozin & Marakhil <sup>11</sup>	36	Khojir <sup>3</sup>	62	Sarigol <sup>1</sup>
11	Central Alborz <sup>2,3</sup>	37	Khoramdareh <sup>12</sup>	63	Siah Kuh of Ardakan <sup>23</sup>
12	Dena <sup>12</sup>	38	Khosh Yeilagh <sup>10</sup>	64	Sorkh Abad <sup>12</sup>
13	Dezful <sup>13</sup>	39	Kiamaki <sup>4</sup>	65	Sorkkeh Hesar <sup>3</sup>
14	Eghlid <sup>9</sup>	40	Kojur <sup>2</sup>	66	Tabas <sup>1,2</sup>
15	Forumad <sup>10</sup>	41	Kolah Qazi <sup>21</sup>	67	Tandooreh <sup>1</sup>
16	Garmsar <sup>10</sup>	42	Lahijan <sup>22</sup>	68	Tang-e-Sayyad <sup>24</sup>
17	Ghorkhod <sup>1</sup>	43	Lar <sup>3</sup>	69	Tooran <sup>10</sup>
18	Ghuchan <sup>1</sup>	44	Manesht & Ghalarang	70	Torbat-e-Heydarieh <sup>1</sup>
19	Gilangharb <sup>11</sup>	45	Marakan <sup>5</sup>	71	Toroud <sup>10</sup>
20	Golestan <sup>14</sup>	46	Mianjangal <sup>9</sup>	72	Varjin <sup>3</sup>
21	Gonbad-e-Kavus <sup>14</sup>	47	Mount Khiz-o-Sorkh <sup>12</sup>	73	Varmanjeh <sup>11</sup>
22	Gorgan <sup>14</sup>	48	Muteh <sup>21</sup>	74	Zarand <sup>8</sup>
23	Haftad Gholeh <sup>15</sup>	49	Naiybandan <sup>23</sup>		
24	Haji Abad <sup>16</sup>	50	Neyriz <sup>9</sup>		
25	Hormod <sup>9</sup>	51	Noshahr <sup>22</sup>		
26	Ilam <sup>17</sup>	52	Oshtorankuh <sup>7</sup>		

Located in: <sup>1</sup>Khorasan (North, Razavi & South Khorasan); <sup>2</sup>Mazandaran Province; <sup>3</sup>Tehran Province; <sup>4</sup>East Azarbaijan Province; <sup>5</sup>West Azarbaijan Province; <sup>6</sup>Ghazvin Province; <sup>7</sup>Lorestan Province; <sup>8</sup>Kerman Province; <sup>9</sup>Fars Province; <sup>10</sup>Semnan Province; <sup>11</sup>Kermanshah Province; <sup>12</sup>Zanjan Province; <sup>13</sup>Kohgiluyeh & Boyer Ahmad Province; <sup>14</sup>Khuzestan Province; <sup>15</sup>Golestan Province; <sup>16</sup>Hamedan Province; <sup>17</sup>Hormozgan Province; <sup>18</sup>Ilam Province; <sup>19</sup>Kerman Province; <sup>20</sup>Kurdistan Province; <sup>21</sup>Ardabil Province; <sup>22</sup>Esfahan Province; <sup>23</sup>Gilan Province; <sup>24</sup>Yazd Province; <sup>25</sup>Chahar Mahal & Bakhtiari Province; <sup>26</sup>Sistan & Baluchistan Province.

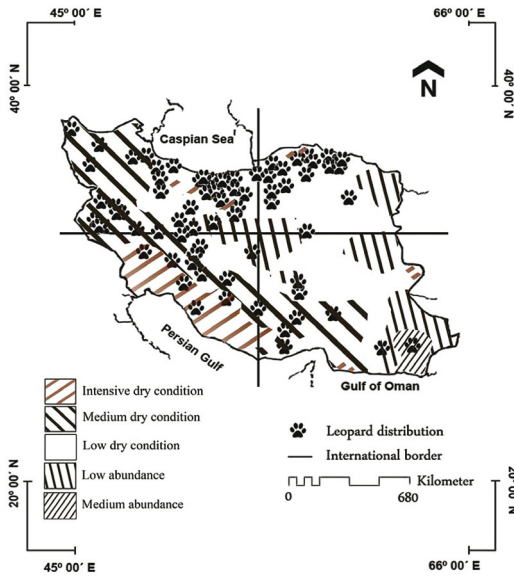


Figure 1. Status of the leopard habitats in terms of monthly rainfall average from October 2009 to May 2010. Intensive dry condition = 45-60% decrease in the normal rainfall trend; medium dry condition = 20-45% decrease in normal trend; low dry condition = <20% decrease in normal trend; low abundance = <20% increase in normal trend; medium abundance = 20-45% increase in normal trend. [Sources: leopard distribution range (Sanei & Zakaria 2011, this issue); map of the dry condition (Agriculture and Natural Resources Research Center, Section of Dry Condition Management for Agriculture Purposes, Isfahan Province, Iran)].

This study was conducted involving a large number of sites (Table 1). Therefore, various methodologies were implemented in the collection of data from each region. These included: (i) interviews with hunters, local settlements, local shepherds as well as rangers of the Iran Department of Environment (DoE); (ii) habitat assessments in terms of prey availability, presence of human disturbance factors, presence of cattle and habitat quality; (iii) studying annual reports from local DoEs; (iv) reports of environmental assessments for various habitats; (v) reports of human-wildlife conflicts and (vi) complaints of local settlements concerning wildlife species infestations. Conflicting reports of wild life species infestations were verified by the study team or wildlife experts of Iran DoE before being recorded.

Leopard threat factors recorded in various sites were classified into seven main groups as follows:

(1) Habitat destructions mainly include altering operations of the lands and changing the land uses, inappropriate farming methods, developing agriculture lands,

## Threats to Persian leopard in Iran

developing residential areas near to wildlife habitats, construction activities inside the wildlife habitats, deforestations, existence of villages inside the protected areas, degradation of the habitats, habitat fragmentations, human population growth and expansion of cities and rural areas, construction of highways passing through wildlife habitats, developing access roads and pathways in villages, irregular industrial exploitations of environmental resources, exploitation of mineral resources, pollutions produced by factories and landfill sites around some wildlife habitats.

(2) Illegal hunting: killing and shooting of leopards and their preys, capturing the lambs, kids and fawns; availability of illegal weapons among local settlements in some areas; poisonous lures, trapping the mammals, trophy hunting and competitions to get the trophy awards.

(3) Lack of conservation facilities: lack of guardsmen to secure the protected areas, lack of facilities and appropriate protective sentry posts in some regions, small number of waterholes in habitats that experience dry condition.

(4) Lack of knowledge by local people, shepherds and tribes about the ecological issues and importance of predators in the health of ecosystems.

(5) Cattle and animal husbandries: irregular grazing of cattle, large number of animal husbandries and livestock present in the habitats, transmission of disease to native wildlife species, reducing habitat safety due to presence of herding dogs and cattle in the habitats.

(6) Dry and unsuitable climatic conditions.

(7) Impacts of war between Iraq and Iran and availability of weapons among local people.

Table 2 shows the frequency of threat factors detected in the various study sites. The main threat factors are habitat destruction followed by illegal hunting and excess of animal husbandries and cattle in the habitats. It is worth mentioning that almost 9% of the habitat destruction was found to be a result of the construction of highways and access routes to the habitats. Furthermore, solid wastes produced by cities form almost 3% of habitat destruction.

Although vast areas of the country receive small amount of rainfall per year, it is suggested that unsuitable cultivation programs by local settlements may have further impacts on underwater routes. During the survey in a place called Kouh Siah (meaning the black mountain) located in Fars Province, we found that several springs in the mountain dried up in recent years. Local experts believe that this could be the consequences of unsuitable cultivation programs conducted in the plain nearby (Daryush Gholami, pers. comm.). However, more studies are required to investigate this issue.

Potential threats associated with the presence of livestock in wildlife habitats could be: (1) transmission of diseases to native wildlife species in the area and (2) lack of safety and preventive measures in a particular habitat. It is known that various disease-causing bacteria and viruses may survive for a long time in pond water and waterholes hence, the probability that wildlife diseases could be transmitted easily to wildlife species through these water sources is quite high.

Table 2. Frequency of threat factors detected in the Persian leopard study sites in Iran.

No.	Factor	Percentage*
1	Habitat destruction	35
2	Illegal hunting	22
3	Cattle and animal husbandries	21
4	Lack of conservation facilities	9
5	Lack of knowledge about ecological issues	9
6	Dry and unsuitable climatic condition	2
7	Impacts of war between Iraq and Iran	2

\*Percentages explain how much of the total detected threat factors in the study sites belong to each specific threat factor. However, the percentages do not explain the impacts of each threat factor on the leopard survival. Furthermore, there could be more threatening occasions that we failed to detect (*e.g.* illegal hunting of leopards or their preys).

Solid wastes from cities that are dumped in landfill sites near and around wildlife habitats would cause unnecessary increase in stray dog visits from nearby settlements. Consequently, stray dogs may prey upon the lambs, kids and fawns and as such would cause rapid decline in populations of prey species of Persian leopard.

Table 3 shows the ranks of wildlife species infestations based on the complaints made by local settlements obtained during a supplementary study involving conflicts/disturbances caused by various wildlife species conducted in 2002 and 2003. Table 4, on the other hand, provides a summary of complaints of local settlements about leopard attacks recorded during the same study period (original data extracted from Sanei 2007).

Based on the regulations of Iran DoE, any loss or disturbance caused by wildlife species would be paid by the Department upon complaint of local settlements. Despite this financial aid, direct shooting and killing of problematic animals as a control measure is still a common practice in the affected settlements.

From 2001 to 2003, this study recorded five cases of leopard attacks on sheep, goats and herding dogs and three cases of attacks on shepherds in a place called Touran, located in Semnan Province. However, no official complaint was made. In addition, seven cases of human or livestock-leopard conflicts were recorded during the study in a place called Dargaz, located in Razavi Khorasan Province. In five out of seven conflict cases, the problem individual (*i.e.* the Persian leopard) was outrightly killed. Similarly, there were several reports of human-leopard conflicts from a village located in Boushehr Province that led to killing of the problem individual. Awareness programs for local settlements about spatial ecology of this territorial large cat and the probability of occupying the area by a new leopard individual after successfully removing the problem animal could be beneficial. Several reports of leopard hunting or accidental kills were recorded in recent years. On various occasions, local settlements use poison-laden lures to kill the wolves

## Threats to Persian leopard in Iran

Table 3. Ranks of wildlife species infestations based on complaints from local settlements in 2002 and 2003 study survey in Iran (Source of data: Sanei 2007).

2002				2003			
Rank	Wildlife species	Complaints n	Percentage	Rank	Wildlife species	Complaints n	Percentage
1	Wolf	12	31.5	1	Wolf	12	42.8
2	Brown bear	8	21.1	2	Leopard	7	25.0
3	Leopard	7	18.4	3	Brown bear	4	14.2
4	Wild pig	5	13.1	4	Wild pig	2	7.1
5	Persian gazelle	2	5.2	5	Black bear	1	3.5
6	Black bear	1	2.6	5	Fox	1	3.5
6	Crocodile	1	2.6	5	Unidentified	1	3.5
6	Jackal	1	2.6				
6	Wild sheep	1	2.6				

Table 4. Records of complaints by local settlements in Iran regarding leopard attacks in 2002 and 2003 (Source of data: Sanei 2007).

Region	Attacked individual/s	Region	Attacked individual/s
2002		2003	
Savad Kuh Township, Mazandaran Province	Herding dog & cow	Bafgh Township Yazd Province	Camel
Sarze Shamil village, Hormozgan Province	Sheep & goat	Rakhsan village Sistan & Balouchistan Province	Goat
Bafgh Township, Yazd Province	Camel	Bazman Township Sistan & Balouchistan Province	Sheep
Amlash Township, Gilan Province	Farm birds	Bazman Township Sistan & Balouchistan Province	Sheep
Bazman Township, Sistan & Balouchistan Province	Sheep	Saravan Township Sistan & Balouchistan Province	Goat
Sheikhlar, Ghazvin Province	Goat	Ghazvin Township Ghazvin Province	Attack on a shepherd caused injuries
Bojnurd City, Khorasan Province	Attack on a shepherd caused injuries	Tnadoureh National Park, Northern Khorasan Province	Sheep

which are responsible for regular livestock losses. However, in a number of cases, the leopards became the actual victims. Furthermore, some poisons could remain effective for a long time in the food chain; therefore, one poison-laden lure could kill several individuals of various wildlife species. Education and awareness programs for local settlers could considerably decrease hunting of the leopards and poaching of their preys in different provinces of Iran. Further study on the range ecology and home range size of the Persian leopards in Iran could help in the capture-and-release programs in cases of human-leopard conflicts.

## ACKNOWLEDGMENTS

The authors acknowledge the kind assistance of various local settlements as well as Staff of the Department of Environment, Iran, particularly Sehaty Sabet, Daryush Gholami, Soltani and Hosseini Tayefeh for their kind cooperation. The productive consultations with the late Dr. H. Asadi, Mr.H. Ziaie (Islamic Azad University, North Tehran branch, Iran) and Dr. B.H. Kiabi (University of Shahid Beheshti, Tehran, Iran) as well as the generous financial support of Gh. Sanei and Sh. Hermidas to this study are highly appreciated.

## LITERATURE CITED

- Anderson, S.H. 1999. *Managing Our Wildlife Resources*. Prentice Hall, New Jersey, USA, 540 p.
- Athreya, V.R., S.S. Thakur, S. Chaudhuri and A.V. Belsare. 2007. Leopards in human-dominated areas: A spillover from sustained translocations into nearby forests. *Journal of the Bombay Natural History Society* 104: 45-50.
- Balme, G. and L. Hunter. 2004. Mortality in a protected leopard population, Phinda Private Game Reserve, South Africa: A population decline. *Ecological Journal* 6: 1-6.
- Edgaonkar, A. and R. Chellam. 1998. A preliminary study on the ecology of the leopard, *Panthera pardus fusca* in the Sanjay Gandhi National Park, Maharashtra, Wildlife Institute of India, Dehra Dun, India.
- Hunter, L., G. Balme, C. Walker, K. Pretorius and K. Rosenberg. 2003. The landscape ecology of leopards (*Panthera pardus*) in northern Kwa Zulu-Natal, South Africa: A preliminary project report. *Ecological Journal* 5: 24-30.
- Joshi, R. 2010. Train accidental deaths of leopards *Panthera pardus* in Rajaji National Park: A population in threat. *World Journal of Zoology* 5: 156-161.
- Khorozyan, I.G., A.G. Malkhasyan and A.V. Abramov. 2008. Presence-absence surveys of prey and their use in predicting leopard (*Panthera pardus*) densities: A case study from Armenia. *Integrative Zoology* 3: 322-332.
- Khorozyan, I.G., A.G. Malkhasyan and S.G. Asmaryan. 2005. The Persian leopard prowls its way to survival. *Endangered Species Update* 22: 51-60.
- Khorozyan, I.G., A.G. Malkhasyan, S.G. Asmaryan and A.V. Abramov. 2010. Using geographical mapping and occupancy modeling to study the distribution of the critically endangered leopard (*Panthera pardus*) population in Armenia, pp. 331-347. *In: Cushman, S.A. and F. Huettmann (Eds.). Spatial Complexity, Informatics and Wildlife Conservation*, Springer, Germany.
- Kiabi, B.H., B.F. Dareshouri, R.A. Ghaemi and M. Jahanshahi. 2002. Population status of the Persian leopard (*Panthera pardus saxicolor* Pocock 1927) in Iran. *Zoology in the Middle East* 26: 41-47.
- Ngoprasert, D., J.L. Antony and A.G. George. 2007. Human disturbance affects habitat use



## Threats to Persian leopard in Iran

- and behaviour of Asiatic leopard *Panthera pardus* in Kaeng Krachan National Park, Thailand. *Oryx* 41: 343-351.
- Nowell, K., H. Bauer, E. Sogbohossou and T. Aristide. 2006. *Conservation Strategy for the Lion in West and Central Africa*. Cat Specialist Group, IUCN, Gland, Switzerland.
- Sanei, A. 2007. *Analysis of Leopard (Panthera pardus) Status in Iran (No.1)*. Sepehr Publication Center (In Persian), Tehran, Iran, 298 p.
- Sanei, A. and M. Zakaria. 2011. Distribution pattern of the Persian leopard (*Panthera pardus saxicolor*) in Iran. *Asia Life Sciences Supplement* 7: 7-18. (this issue)
- Sanei, A., M. Zakaria, E. Yusof and M. Roslan. 2011. Estimation of leopard population size in a secondary forest within Malaysia's capital agglomeration using unsupervised classification of pugmarks. *Tropical Ecology* 52(2): 209-217.
- Sinclair, A.R.E., J.M. Fryxell and G. Caughley. 2006. *Wildlife Ecology, Conservation and Management*. Blackwell Publishing, Massachusetts, USA, 469 p.
- Sunquist, M. and F. Sunquist. 2002. *Wild Cats of the World*. University of Chicago Press, Chicago, Illinois, USA, 452 p.
- World Bank. 2005. *Islamic Republic of Iran Cost Assessment of Environmental Degradation, Report No. 32043-IR*. World Bank.

*Beyond Excellence*®  ASIA LIFE SCIENCES

The Asian International Journal of Life Sciences  
Cellular phone no. (63) 0915-360-4660  
Telephone no. (63)(49) 501-2957  
e-mail: [asialifesciences@yahoo.com](mailto:asialifesciences@yahoo.com)  
<http://journals.uplb.edu.ph/index.php/ALS>

©Rushing Water Publishers Ltd., Philippines 2011

The papers published in *Asia Life Sciences* are indexed in the *Biological Abstracts*, *CAB Abstracts*, *CAB Global Health*, *Zoological Record*, *SciSearch*®/*Science Citation Index Expanded*, *Journal Citation Reports/Science Edition*, *BIOSIS Previews*, *ISI Web of Science*®, *ISI Web of Knowledge*® and are covered by the *Thomson Reuters-Institute for Scientific Information (ISI)*, USA and *CABI*, Wallingford, OXON, UK.

*Asia Life Sciences* has an Impact Factor of 0.259.

*Asia Life Sciences* is a recipient of the Journal Accreditation Award from the Commission on Higher Education (CHED), Republic of the Philippines (2010-2011).

Printed on acid-free papers.