



## *Species at Risk*

# Status and Distribution of the Leopard (*Panthera pardus*) in Turkey and the Caucasus Mountains

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### **Abstract**

For millennia large mammalian carnivores, including the Caspian tiger (*Panthera tigris virgata*), Asiatic lion (*Panthera leo persica*), brown bear (*Ursus arctos*), gray wolf (*Canis lupus*), striped hyena (*Hyaena hyaena*), Eurasian lynx (*Lynx lynx*) and three subspecies of leopard (*Panthera pardus tulliana*, *P.p. saxicolor* and *P.p. ciscaucasica*) roamed mountains, plateaus and grasslands of Turkey, historically known as Asia Minor or Anatolia. Of the big cats, only the leopard and Eurasian lynx remain in increasingly isolated mountainous habitats. Evidence suggests a few leopards remain in Turkey's Black Sea mountain ranges and the inaccessible peaks of the Taurus Mountains in the south. Also, despite centuries of persecution, the leopard still exists in the Greater and Lesser Caucasus Ranges of Armenia, Azerbaijan and Georgia, receiving some juvenile immigration from a larger population in northern Iran's Zagros Mountains. Leopard conservation throughout the Caucasus countries and Turkey will only succeed if viable populations of ungulate prey such as the Bezoar goat (*Capra aegagrus*), and wild boar (*Sus scrofa*) can be sustained in protected and unprotected habitats, and people in the region are educated about the importance of these species to the sustainability of the ecosystem.

L e o p a r d
K i n g d o m : A n i m a l i a
P h y l u m : C h o r d a t a
C l a s s : M a m m a l i a
O r d e r : C a r n i v o r a
F a m i l y : F e l i d a e
G e n u s : P a n t h e r a
S p e c i e s : <i>P a n t h e r a p a r d u s</i>

For millennia large mammalian carnivores, including the Caspian tiger (*Panthera tigris virgata*), Asiatic lion (*Panthera leo persica*), brown bear (*Ursus arctos*), gray wolf (*Canis lupus*), striped hyena (*Hyaena hyaena*), Eurasian lynx (*Lynx lynx*) and three subspecies of leopard (*Panthera pardus tulliana*, *P.p. saxicolor* and *P.p. ciscaucasica*) roamed mountains, plateaus and grasslands of Turkey, historically known as Asia Minor or Anatolia. Of the big cats, only the leopard and Eurasian lynx remain in increasingly isolated mountainous habitats. Evidence suggests a few leopards persist in Turkey's Black Sea mountain

Zagros Mountains (Figure 1).

The DNA in leopard hair samples collected in scat may help settle a taxonomic controversy. In recent years, there has been considerable discussion as to the validity of dividing southwestern Asia's leopard population into several distinct subspecies based on morphological differences (Uphyrkina et al. 2001; Khorozyan 1999c). Recently, the mitochondrial DNA sequences of 77 leopards from known geographic locations representing 13 of the 27 described subspecies were studied (Uphyrkina et al. 2001). The research revealed abundant diversity that could be divided into a minimum of nine discrete populations that include *P.p. saxicolor*, although *P.p. tulliana* and *P.p. ciscaucasica* were not identified as distinct subspecies (Uphyrkina et al. 2001).

This corroborates other recent proposals to reclassify all southwestern Asian leopard subspecies from Asia Minor to Afghanistan (including *P.p. ciscaucasica*, *P.p. dathei*, *P.p. jarvisi*, *P.p. nimr*, *P.p. saxicolor*, *P.p. sindica* and *P.p. tulliana*) as *P.p. saxicolor*, based on the absence of significant morphological differences or geographic barriers in the region (Miththapala et al. 1996). This reclassification may well be too broad, since different research demonstrated that *P.p. nimr*, the Arabian leopard, has mDNA distinct from *P.p. saxicolor* (Uphyrkina et al. 2001). The Arabian leopard is the smallest leopard subspecies, with adult females weighing as little as 23 kg (Holby 2003). Due to the fact that the controversy on the leopard's subspecies remains, we are using the traditional subspecies division in this article.

*Panthera pardus tulliana*, once ranged widely throughout Anatolia and south into Syria, Lebanon and Israel. Some

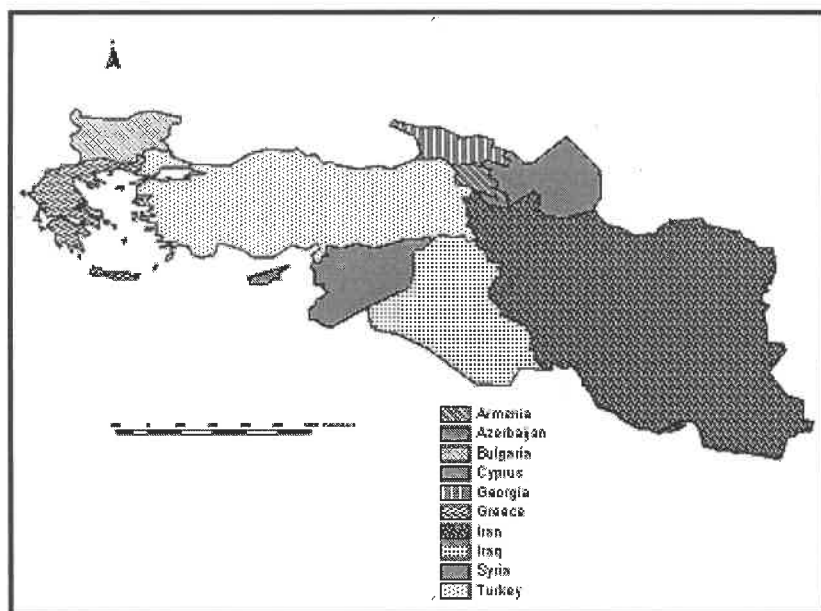


Figure 1. Turkey and bordering countries.

ranges and the inaccessible peaks of the Taurus Mountains in the south. Also, despite centuries of persecution, the leopard still exists in the Greater and Lesser Caucasus Ranges of Armenia, Azerbaijan and Georgia, receiving some juvenile immigration from a larger population in northern Iran's

specimens of *P. p. tulliana* killed in Anatolia were among the largest leopards known, exceeding 100 kg in weight and reaching a length of 2.5 meters, including an 80 cm long tail (Tubitak Sage 2002). Leopard deaths were reported in 1964 and 1965 in the southwestern Aegean Mountains near Kusadasi and Milas and in 1966 from the districts of Semdinli and Ozalp (Hurriyet 2002). In the 1950s and 1960s, German zoologist H. Kumerloeve discovered evidence of leopards existing in the western Taurus Mountains. The Turkish hunter Mantolu Hasan (also known as Mehmet Mantoluoglu) claimed to have killed more than fifteen leopards, mostly by poisoning, between the 1950s and early 1970s (Samli 2002; Ulrich and Riffel 1993). In the 1970s Turkish biologist Tansu Gurpinar estimated that only ten leopards still existed in the southern Taurus and western Pontic (Kure) Mountains (Cat News 1989). In 1974, a leopard was killed near the village of Bagozu in Ankara Province in west-central Turkey. This cat had reportedly attacked and severely wounded a woman, and was tracked by villagers for 12 hours before it was cornered and killed (Cat News 1989; Can 2001).

In 1978 the International Union for the Conservation of Nature (IUCN) estimated there were no more than 23 leopards left in Anatolia (Can 2001). It is estimated that at present time 250 Arabian leopards survive on the Arabian peninsula, the Gulf countries, and possibly Egypt's Sinai Peninsula, with 100-150 of these living in Oman's Jebel Dhofar Mountains (Hilotin 2003). There is evidence that a relict population of leopards still persists in the Taurus Mountains of southern and eastern Turkey, from both confirmed tracks and scat discovered (Can 2001). The Ala Dagi (3,734 m) is the highest point of the Taurus Range, which extends approximately 560 km roughly parallel to the Mediterranean coast, connecting with the Anti-Taurus Range, a thickly wooded eastern Anatolian chain along the Seyhan River (Encyclopedia.com 2002).

From 1985 to 1992 two German bi-

ologists conducted several field surveys in Termessos National Park in the Taurus Mountains of southwestern Turkey, and examined fresh scat clearly demonstrated by size and odor to be from a big cat (Ulrich and Riffel 1993). The Termessos National Park, the contiguous Olimpos-Beydaglari National Park and the Duzlercami Game Reserve form a total protected area of nearly 100,000 hectares west, southwest and south of Antalya (Figure 2) (Ulrich and Riffel 1993). The game reserve, in particular, is known as the last indigenous stronghold of the fallow deer (*Dama dama*) in Turkey, and contains abundant wild boar (*Sus scrofa*), plus a 4,000-5,000-strong population of Bezoar wild goat (*Capra aegagrus*) (Ulrich and Riffel 1993). This protected region consists of rough limestone mountain ridges rising to



3,000 m, and its dense pine and oak forests are undoubtedly one of the last retreats of the Anatolian leopard (Ulrich and Riffel 1993). Nevertheless, there is convincing evidence that some leopards may still survive in unprotected areas of the western Taurus Range. In 1989, a leopard was shot near the town of Kas south of Antalya, and there was a reported sighting near Alanya, east of Antalya, in 1991 (Ulrich and Riffel 1993).

The historic range of Anatolian leopards extended well south of southern Turkey into Palestine. In the late

Leopard (*Panthera pardus*).  
Photograph by Gary M. Stolz  
(U.S. Fish and Wildlife Service).

1970s, Turkish biologists estimated that just ten leopards still survived in Hakkari Province bordering Syria (Cat News 1989). There are confirmed reports of leopards, possibly *P.p. tulliana*, in the disputed Golan Heights region on the Israeli-Syrian border, and Mount Hermon in Lebanon, indicating that an endemic population in this area still exists (Gazelle 2002).



Mountains of southwest Turkey's coastline.  
Photograph by Kirk Johnson.

Caucasus leopard (*Panthera pardus ciscaucasica*) population relicts still persist not only in the mountain ranges of northern Turkey, but also in the Caucasus Mountains that border the Black Sea, within the republics of Georgia, Armenia and Azerbaijan (Environment News Service 2003; Tolordava 2003). In Georgia, the Caucasus leopard historically inhabited the 3,000-meter "Lesser Caucasus" Range that is adjacent to the Kackar Range (Environment News Service 2003). In contrast to the sheer precipices of the Kackars, however, the Lesser Caucasus Mountains' rounded subalpine grassy slopes consist largely of treeless mountain steppe and meadows.

In February 2002 Turkish mountaineers discovered and photographed a 13 centimeter-wide track in the snow along the higher slopes of Kackar Mountain. The track was later confirmed to be from a big cat by Marmara Forest Services Regional Manager Erkan Kayaoz (Samli 2002). A team of Turkish researchers had been tracking from

the Pokut Plateau onto Hazidag Mountain in the Kackar Range what they assumed to be a leopard, but was unsuccessful in sighting the felid (Gulas 2003). In the spring of 2002 two separate teams re-ascended Hazidag and both claimed to see a leopard in separate encounters, even taking videotape and photographs (Gulas 2003; Samli 2002). The first expedition took footage of a leopard in a pine tree, while the second team spotted a leopard on a Hazidag outcrop (Gulas 2003; Samli 2002).

As of 2003, two discrete endangered populations of the Caucasus leopard are known to still inhabit Georgia's Lesser Caucasus Mountains, and also the Talysh Mountains in the south bordering Azerbaijan (Tolordava 2003; Environment News Service 2003). Only a total of 20-23 individuals are thought to survive in both ranges, and are described as "secretive, cautious, and highly mobile" (Environment News Service 2003). Currently, a study of leopard numbers in northern Azerbaijan's Talysh Mountains is underway, with only 10-12 of the big cats thought to survive in that country (Environment News Service 2003). In the Nagorno-Karabakh Armenian enclave within Azerbaijan, data from hunters indicate another five to seven cats may survive (Tolordava 2003). According to recent data, between one and two leopards are killed each year in the Caucasus countries (BBC News 2003).

The Caucasus and eastern Anatolia region historically hosted a third leopard subspecies, *P.p. saxicolor*, known as the Iranian or Persian leopard (Tubitak Sage 2002). The Persian leopard is still considered relatively common in northern Iran, especially in the Zagros Mountains (Khorozyan 2000; Tubitak Sage 2002). Leopards in Iran have been known to exceed 90 kg and are often mistaken for snow leopards (*Uncia uncia*), due to their lighter color and long-haired winter coats (Holby 2003; Khorozyan 1999c). Armenian and Iranian biologists have noted frequent emigration of juvenile *P.p. saxicolor* from Iran into southern Armenia, especially

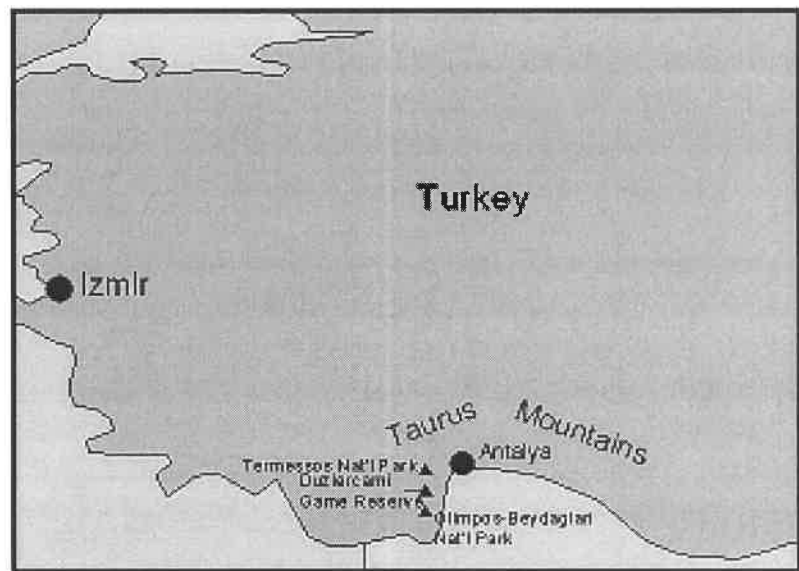
along Armenia's Zangezur Ridge, which acts as a wildlife corridor between the two countries (Khorozyan 2000; Khorozyan 1999c).

Since the 1990s, all confirmed records of Persian leopards are confined to three southern Armenian provinces: Ararat, Vayots Dzor, and Syunik (Khorozyan 2000). The southwestern province of Ararat borders Azerbaijan's isolated enclave province of Nakhichevan (Khorozyan 2000), while Vayots Dzor and Syunik provinces border northern Iran. Noravank Canyon, a habitat corridor lying along the Armenian-Nakhichevan border, still exists between southern Armenia and the Khosrov Reserve in Ararat province (Khorozyan 2000). Dispersal of juvenile leopards through Novavank Canyon, however, is threatened by roads connecting canyon villages and the complete diversion of water from the canyon for village uses and irrigation (Khorozyan 2000).

Between 2000 and 2002, Armenian biologist Igor Khorozyan studied an estimated population of ten *P.p. saxicolor*, including at least two females with cubs that lived within a 780 km<sup>2</sup> region in Ararat province, encompassing the 258.6 km<sup>2</sup> Khosrov Reserve (Khorozyan 1999b; Khorozyan 2003a). Unfortunately, this rugged mountainous habitat is severely fragmented into five small, isolated pockets and leopards move in and out in unprotected private land adjacent to the reserve (Khorozyan 2003a). Within the reserve itself, leopards prefer sparse juniper/beechnoak forests growing along the ridge tops, where their preferred prey, the bezoar wild goats (*Capra aegagrus*), lives. Bezoar wild goats are still plentiful within the preserve and surrounding areas, and anecdotal evidence suggests that between 900-3,000 of the ungulates live in Khosrov (Khorozyan 2003a). Leopard scat analyses demonstrated that bezoar goats make up to 90% of all prey consumed (Khorozyan 2003a). In 2003, research continues with the use of infrared cameras to photograph leopards in southern Armenia (Khorozyan 2003b). In addition, stud-

ies are planned with the goal of enlarging adjacent protected areas within northern Azerbaijan's Talysh Mountains (Tolordava 2003).

The World Wildlife Fund (WWF) is currently surveying for leopard populations that may still persist in the central and northwestern portions of the Greater Caucasus Mountains (Environment News Service 2003; Tolordava 2003). The Greater Caucasus Mountains has a particularly high ratio of endemic life, with approximately 6,300 plant species, 1,600 of which are restricted to the region (Conservation In-

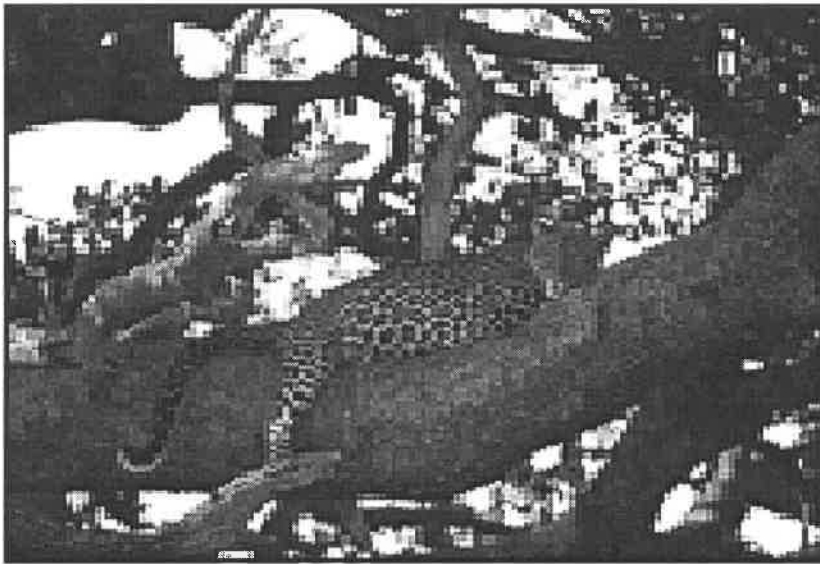


ternational 2003). In addition, 59 of the 632 vertebrate species found in the Caucasus are endemic, a diversity up to three times greater than the one found in surrounding regions (Conservation International 2003). Species of ungulates include such mammals as the endemic East Caucasian and West Caucasian tur (*Capra cylindricornis* and *Capra caucasica*, respectively), the non-endemic chamois (*Rupicapra rupicapra*), Caucasian red deer (*Cervus elaphus maral*), bezoar wild goat, and mouflon wild sheep (*Ovis orientalis gmelini*) (Gokhelashvili 2003). All of these ungulates are potential prey species for leopards. Protecting a keystone species like the leopard may help to preserve this astounding array of species and the Caucasus' unique

Figure 2. Protected areas in southwest Turkey. Map by Kirk Johnson.

fragile web of life.

Approximately 35% of the Greater Caucasus ecoregion remains as natural forest, but only five percent has protective guidelines (Gokhelasvili 2003). The principal threats to the ecosystem include rural poverty and escalating corruption, resulting in increasing demands for firewood, livestock overgrazing, poor forest management, illegal timber harvesting, and poaching of wildlife, especially economically valu-



Leopard (*Panthera pardus*).  
Photograph by Gary M. Stolz  
(U.S. Fish and Wildlife Service).

able species (Gokhelasvili 2003). For example, local people have turned to hunting wild goats, boar and deer—the leopard's main prey, to supplement their small incomes (BBC News 2003). This has forced the leopard to increasingly prey on flocks of domestic sheep and goats near human settlements (BBC News 2003).

Studies in the Khosrov reserve confirm that one of the most serious dangers to the existence of the leopard is degraded or developed private land buffer zones, which represents a significant leopard mortality threat (Khorozyan 2003a). This risk was verified in 1986, when a herdsman poached a pregnant female illegally in the reserve. Due to this loss, the population vanished for several years, reemerging in early 1992 through immigration (Khorozyan 1999a). Although people

sometimes kill leopards (three out of ten confirmed records between 1990-2000 in Khosrov Reserve were killings: two cubs and one adult male, all in January 2000), the majority of Armenians living around the reserve feel completely indifferent to the leopard and its conservation, primarily due to the fact that they rarely attack livestock (Khorozyan 2001).

Unfortunately, state-run wildlife protection safeguards have collapsed due to a lack of government funding (BBC News 2003). WWF is developing partnerships with governmental and non-governmental agencies and leopard experts from Armenia, Azerbaijan, Georgia and Russia in an attempt to assess critical habitat and then initiate conservation and protection of these sites (Environment News Service 2003). WWF plans call for the strengthened legal protection for the leopard and key prey species, better management of existing protection areas, and the establishment of new protected zones (Environment News Service 2003). In addition, there are plans for the formation of anti-poaching units in each country, development of education programs, and compensation to local farmers for any livestock depredation (Tolordava 2003; Environment News Service 2003). The leopard mortalities in Armenia demonstrate the importance of connectivity in habitat protection. *P.p. saxicolor* inhabiting northern Iran, *P.p. ciscaucasica* ranging in Georgia, and *P.p. tulliana* found in territories in the Turkey's Black Sea area may well represent one continuous leopard population.

Like all big cats, leopards are charismatic predators that generate attention and excitement of people around the globe. If this excitement can be translated into concrete plans on the ground to protect the leopard and its habitat, all animals and plants down in the food chain will benefit. The fact that some leopards have survived centuries of indiscriminate shooting and warfare throughout this region offers hope that even limited efforts to save the cat may reap lasting dividends.

## Literature Cited

- British Broadcasting Corporation News (BBC News). Battle on to save Caucasus big cat. <[news.bbc.co.uk/1/hi/world/europe/2700129.stm](http://news.bbc.co.uk/1/hi/world/europe/2700129.stm)> (March 6, 2003).
- Can, E. 2001. Bir efsane yasiyor. Atlas 98 (May): 16-17.
- Cat News. 1989. Anatolian leopard on the brink. Cat News 11: (summer).
- Conservation International. Biodiversity hotspots: Caucasus. <[www.biodiversityhotspots.org/xp/Hotspots/caucasus](http://www.biodiversityhotspots.org/xp/Hotspots/caucasus)> (March 6, 2003).
- Encyclopedia.com. Taurus Mountains. <[www.encyclopedia.com](http://www.encyclopedia.com)> (October 29, 2002).
- Environment News Service. WWF champions Caucasus leopard. <[www.ens-news.com/ens/jan2003/2003-01-27-19.asp](http://www.ens-news.com/ens/jan2003/2003-01-27-19.asp)> (February 4, 2003).
- Gazelle. Wild Cats in Palestine. The Palestinian Biological Bulletin. <[www.gazelle.8m.net/](http://www.gazelle.8m.net/)> (November 19, 2002).
- Gokhelasvili, R. Terrestrial ecoregions: Caucasus mixed forests (PA0408). <[www.worldwildlife.org/wildworld/profiles/terrestrial/](http://www.worldwildlife.org/wildworld/profiles/terrestrial/)> (March 6, 2003).
- Gulas, C. The leopard. <[www.cemalgulas.com/dosya/pars](http://www.cemalgulas.com/dosya/pars)> (May 6, 2003).
- Hilotin, J.B. Public awareness key to protecting Arabian leopard. <[www.gulfnews.com/articles/news.asp?](http://www.gulfnews.com/articles/news.asp?)> (March 6, 2003).
- Holby, H. Leopard. <[www.hazelh.best.vwh.net](http://www.hazelh.best.vwh.net)> (May 6, 2003).
- Hurriyet. 2002. Anadolu lepari acaba yasiyor mu? Hurriyet Bilim ve Teknoloji Gazetesi 22 (June 8).
- Khorozyan I. Persian leopard (*Panthera pardus saxicolor*) in Armenia: diet and prey; spacing and activities. <[www.persianleopard.com/diet.htm](http://www.persianleopard.com/diet.htm)> (May 20, 2003a).
- Khorozyan, I. Chairman, Armenian Leopard Conservation Society, Armenia: personal communication. (May 20, 2003b).
- Khorozyan, I. 2001. Human attitudes to the leopards in Khosrov reserve, Armenia. Cat News 34: 14-17.
- Khorozyan, I. 2000. The leopard in Armenia's Khosrov reserve: spots, rosettes and population genetic status. Cat News 33: 16-18.
- Khorozyan, I. 1999a. Modeling mortality patterns of Armenian leopard population. Natural Science 1: 24-27.
- Khorozyan, I. 1999b. Leopard records in Armenia in the 1990s. Cat News 31: 13-15.
- Khorozyan, I. 1999c. The leopard in Armenia: which subspecies is it? Cat News 30: 22-24.
- Miththapala, S., J. Seidensticker, and S. O'Brien. 1996. Phylogeographic subspecies recognition in leopards (*Panthera pardus*) molecular genetic variation. Conservation Biology 10: 1115-1132.
- Samli, M. Anatolian leopard is alive. <[www.wildlifeasyst.com/Anatolian\\_leopards.htm](http://www.wildlifeasyst.com/Anatolian_leopards.htm)> (May 7, 2003).
- Tolordava, K. WWF launches project to save the Caucasus leopard. <[www.panda.org/news\\_facts/newsroom/other\\_news](http://www.panda.org/news_facts/newsroom/other_news)> (June 17, 2003).
- Tubitak Sage. Anadolu parsi. <[www.sage.tubitak.gov.tr/Yasam](http://www.sage.tubitak.gov.tr/Yasam)> (November 5, 2002).
- Ullrich, B. and M. Riffel. 1993. New evidence for the occurrence of the Anatolian leopard, *Panthera pardus tulliana* (Valenciennes, 1856), in western Turkey. Mammalia, Zoology in the Middle East 8: p. 5-14.
- Uphyrkina O., W.E. Johnson, H. Quigley, D. Miquelle, L. Marker, M. Bush, and S.J. O'Brien. 2001. Phylogenetics, genome diversity and origin of modern leopard, *Panthera pardus*. Molecular Ecology 10: 2617-2633.

