Short Communication

Does the leopard *Panthera pardus* still exist in the Eastern Karadeniz Mountains of Turkey?

Sagdan Baskaya and Ertugrul Bilgili

Abstract The Anatolian leopard *Panthera pardus tulliana* is categorized as Critically Endangered, and the last known record of this subspecies in Turkey was the finding of fresh faecal pellets in 1992 in Termossos National Park. The leopard formerly occurred across most of Turkey, but particularly in the west, south and south-east regions. In this study we investigated the existence of the leopard in the Eastern Karadeniz Mountains in the north-east, where there have been no records of the leopard since 1956. Surveys for leopard sign, lasting 2–8 days each, were carried out from 1993 to 2002 at 46 sites. We found leopard footprints, which could be clearly differentiated from those of lynx *Lynx lynx* by their size, at 16 survey sites from Çapans Mountains in the west to Karçal Mountain in the east. Further work now needs to be carried out to ascertain the size and status of the remaining leopard population.

Keywords Distribution, Eastern Karadeniz Mountains, leopard, *Panthera pardus tulliana*, Turkey.

The leopard *Panthera pardus* has the largest range, west to east, of any of the large felids. Although populations have become fragmented, they still occur throughout Africa with the exception of the Sahara desert, from the Arabian Peninsula to Turkey and across the southern half of Asia, and north through eastern China to the land bordering the Amur River. There are two island populations, on Sri Lanka and Java (Richardson, 1992). Reliefs, tomb scenes and leopard bones indicate that the leopard has existed in Turkey from about 6000 BC up to the 20th century (Helck, 1968; Boessneck & v.d.Driesch, 1975, quoted in Kumerloeve, 1980; Çelik, 1987). The Anatolian leopard *P. pardus tulliana* was described in 1856 (as *Felis tulliana*), and named after Marcus Tullius Cicero, a Roman administrator in the province of Cilicia who provided the first historical information on the species in Asia Minor (Valenciennes, 1856, quoted in Ullrich & Riffel, 1993). It was reported that leopards were captured in Asia Minor, particularly from the Taurus, for the Romans (Huş, 1974; Gürpınar, 2000). In Anatolia, leopards were used for hunting during the reign of the Anatolian Seljukians (1077–1307) and of the Ottomans (1299–1923) (Çanakçıoğlu & Mol, 1996).

Most of the 20th century reports of leopards in west, south and south-east Anatolia come from Kumerloeve (Kumerloeve, 1956, 1957, 1967, 1970, 1971, 1975, 1976, 1978), who stated (Kumerloeve, 1975) that during 1930–1950 the celebrated leopard hunter Hasan Mantoluoglu from Milas hunted *c.* 50 leopards. Records of leopard have, however, been rare since the 1960s. The only records are from Abant Lake, Bolu, in 1967 (Gürpınar, 1974), Karakale Village, Kars, in 1970, Ağrı Mount in 1972 (Baytop, 1973), Çatacık, Eskişehir in 1972 and Bağözü Village, Beypazarı, in January 1974 (Gürpınar, 1974).

Leopards from the south, south-western and north-western parts of Turkey have been identified as belonging to only one subspecies, *P. pardus tulliana* (Kumerloeve, 1971; Gürpınar, 1974; Huş, 1974; Kumerloeve, 1976; Borner, 1977; Turan, 1984; Mendelssohn, 1990; Riffel, 1990; Green, 1991; Ullrich & Riffel, 1993; Jackson, 1994; Gürpınar, 2000). Information for the north-eastern, east and south-eastern part of Turkey are insufficient to determine which subspecies occurs in this region. The Anatolian leopard is categorized as Critically Endangered on the IUCN Red List (2003). Ironically, however, until 1987 it was a game species that could be hunted in all seasons in Turkey (Anon., 1987).

Today, there are conflicting reports of the existence of the leopard in Turkey. While some believe that the leopard is either extinct or that, even if some individuals still survive, the population is not viable (Kasparek & Kasparek, 1990), others have reported that 13–15 (Gürpınar, 1974; Goodwin & Holloway, 1978) or <250 (IUCN, 2003) individuals remain. Recent reports indicate that leopard still survive in some parts of Turkey (Baskaya & Serez, 1998; Can, 2002; Serez & Baskaya, 2002). Support for this came from the finding of fresh

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leopard faecal pellets in the Termossos National Park in south-western Turkey in 1992 (Ullrich & Riffel, 1993) and recent eyewitness accounts of a kill of a melanistic (black) leopard in Sukavuşumu, Yusufeli in 1999. Many of these reports of leopard have come from the south and south-west, and some from the north-east. A few of the reports were actually of lynx, some were ambiguous, and others have not been investigated. The study reported here was conducted to investigate the potential existence of leopard in the Eastern Karadeniz Mountains, where there has been no study to ascertain the previous accounts of the presence of the species.

The Eastern Karadeniz Mountains (Fig. 1) have several peaks that rise above 3,000 m. Populated areas are mostly at lower altitudes, and above 1,000 m the density of people is <50 per km^2. About 25% of the study area is protected by national parks, nature parks, nature conservation areas, game conservation areas and a biodiversity and natural resources management area. Precipitation is almost uniformly distributed across the seasons. The maximum precipitation occurs in Rize (altitude 30 m), with an average total of 2,500 mm, and where the mean daily temperature is 8–14ºC. The alpine zone above 2,000 m is usually covered with snow for at least 6 months of the year.

The major vegetation types in these mountains are dune, stream, pseudo-maquis, forest, and subalpine and alpine vegetation, with forest predominating. Tree species include sessile oak *Quercus petrae,* chesnut *Castanea sativa,* hornbeams (*Carpinus* spp.), black alder *Alnus glutinosa,* oriental beech *Fagus orientalis*, oriental spruce *Picea orientalis*, Caucasian fir *Abies nordmanniana* and Scotch pine *Pinus silvestris*. Alpine vegetation starts at 1,800–2,000 (−2,500) m. The trees of the upper forest vegetation (1,500–2,000 (−2,500) m) also include *Populus tremula.* Subalpine meadows are dominated by both woody and herbaceous plants, and the alpine zone is rich in herbaceous plants and dwarf shrubs (Vural, 1996). The area is one of the most important bird conservation areas in Turkey (Baskaya, 1995; Yarar & Magnin, 1997), and mammals found in the area include wolf *Canis lupus*, lynx *Lynx lynx*, brown bear *Ursus arctos*, chamois *Rupicapra rupicapra*, wild goat *Capra aegagrus*, roe deer *Capreolus capreolus*, wild boar *Sus scrofa* and hare *Lepus europeaus* (Baskaya, 2000).

Observations were carried out from 1993 to 2002. To determine survey sites and potential leopard habitat, 1:25,000 and 1:100,000 scale maps were used. Forty-six areas where the leopard had supposedly been seen were visited (Table 1; Fig. 1). Observations were generally carried out in the upper forest, subalpine and alpine zones, in areas where there had been little human intervention, over trips that lasted 2–8 days. Observations of tracks and signs, especially footprints, were used to determine the existence of leopard. Identification and differentiation of leopard tracks from those of lynx was made based on size. Tracks made by lynx in the area are 4–7 cm long and 4.5–8 cm wide. Tracks larger than 9 cm in length and width were considered to be of leopard. During each survey, 3,000–6,000 ha of land were

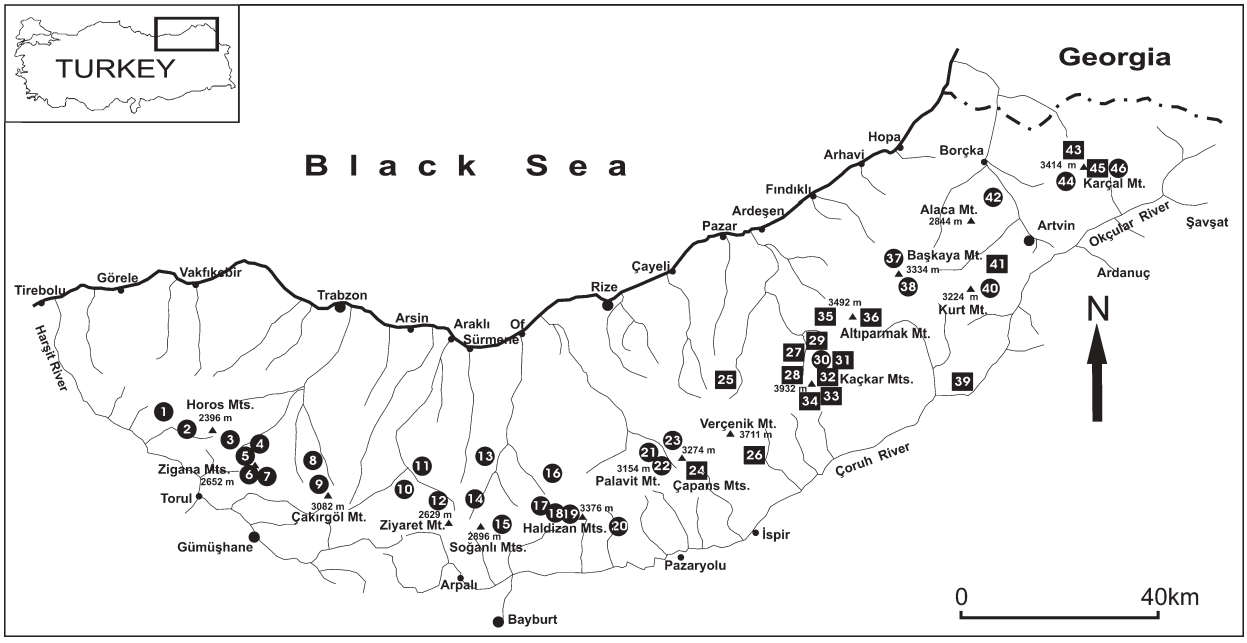

Fig. 1 The Eastern Karadeniz Mountains of Turkey (see inset map) indicating the location of the 46 survey sites (see Table 1). Numbers in squares represent sites where leopard sign was observed.

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Table 1 Locality and mountain or mountain range of the 46 survey sites (see Fig. 1) in the Eastern Karadeniz Mountains, with observation dates and the range of altitude over which leopard signs were found (all signs were footprints) at 16 of the sites.

Site no.	Locality (altitude, m)	Mountain range (max. altitude, m)	Observation dates	Altitude range of signs
1	Damliköy Yayla (1,600)	Horos Mts (2,396)	11–14 July 1997	
2	Erikbeli Yayla (1,650)		18–21 Sep. 1996	
3	Zal Yayla (2,100)	Zigana Mts (2,652)	8–11 June 1996	
4	Balihor Yayla (1,750)		26–28 Apr. 1995	
5	Zigana Yayla (2,000)		27–28 Feb. 1996	
6	Alas Yayla (2,300)		8–11 Dec. 1995	
6	Alas Yayla (2,300)		20–22 July 1996	
7	Değirmitaş Yayla (2,150)		15–17 Nov.1996	
8	Fırınoba Yayla (2,350)	Çakırgöl Mt. (3,082)	8–11 May 1998	
9	Deveboynu Yayla (2,500)		8–11 Aug. 1997	
10	Demirtaş Yayla (2,100)	Ziyaret Mt. (2,629)	22–24 Sep. 1995	
11	Salarut Yayla (2,050)		13–16 Oct. 1995	
12	Güngören Yayla (2,000)		16–19 June 1995	
13	Sultan Murat Yayla (2,000)	Soğanlı Mts (2,896)	26–29 July 1995	
14	Ablaryas Yayla (2,050)		7–13 May 1993	
15	Koğuktaş Hill (2,247)		10–14 May 1994	
16	Yente Yayla (2,350)	Haldizan Mts (3,376)	11–12 July 1998	
17	Multat Yayla (2,200)		30 July–6 Aug. 1995	
18	Balık Gölü (2,750)		22–26 June 1995	
18	Balık Gölü (2,750)		16–21 Aug. 1995	
19	Sarıgöl (2,850)		6–9 July 1996	
20	Yoncalı Village (2,000)		12–13 Jan. 1997	
21	Zorkar Yayla (2,600)	Palavit Mt. (3,154)	18–20 May 1996	
21	Zorkar Yayla (2,600)		20–23 Apr. 1997	
22	Leciş Yayla (2,650 m)		31 May–4 June 1996	
22	Leciş Yayla (2,650)		18–21 Oct. 1996	
23	Büyük Yayla (2,700)	Çapans Mts (3,274)	22–27 May 1998	
24	Çitrik Gölü (2,850)		15–21 Aug. 1997	2,700–2,800
25	Kito Yayla (2,000)	Verçenik Mt. (3,709)	8–11 Aug. 1998	1,800–1,850
26	Yedigöl (1,900)		15–20 Aug. 1996	
26	Yedigöl (1,900)		15–20 Sep. 1998	1,800–1,950
27	Aşağı Kavron Yayla (1,900)	Kaçkar Mts (3,932)	25–30 May 1995	1,800–1,850
28	Yukarı Kavron Yayla (2,250)		23–26 Feb.1995	
28	Yukarı Kavron Yayla (2,250)		25–30 Aug. 1995	
28	Yukarı Kavron Yayla (2,250)		28 July–3 Aug. 1996	2,500–2,750
28	Yukarı Kavron Yayla (2,250)		11–14 Oct. 1996	
29	Aşağı Ceymakçur Yayla (2,000)		15–18 Mar. 1996	1,800–1,850
30	Yukarı Ceymakçur Yayla (2,200)		17–20 Nov. 1995	
30	Yukarı Ceymakçur Yayla (2,200)		20–23 June 1997	
31	Ceymakçur Hill (3,420)		18–21 July 1997	2,900–3,000
31	Ceymakçur Hill (3,420)		22–27 Oct. 1997	
32	Dübedüzü (2,750)		18–22 June 1996	
32	Dübedüzü (2,750)		27 June–4 July 1998	2,800–2,900
32	Dübedüzü (2,750)		11–18 Oct. 2002	
33	Dilberdüzü (2,800)		17–22 Sep. 2001	3,000–3,800
34	Adsız Göl (3,300)		14–20 Aug. 1996	3,100–3,300
34	Adsız Göl (3,300)		11–16 July 1996	
34	Adsız Göl (3,300)		2–4 Sep. 1998	
35	Yukarı Kaçkar Yayla (2,400)	Altıparmak Mt. (3,492)	24–30 June 1997	2,300–2,350
36	Karagöl (2,650)		25–29 July 1997	2,500–2,900
37	Horhat Yayla (2,400)	Baskaya Mt. (3,334)	14–15 July 1999	
38	Yüksekoba Yayla (2,100)		14–15 July 1999	
38	Yüksekoba Yayla (2,100)		1–5 Nov. 1995	
39	Eğribakacak Hill (1,391)	Sukavuşumu Mevkii (500)	23–24 July 1997	1,200–1,250
40	Perikaya Hill (2,296)	Kurt Mt. (3,224)	3–8 Dec. 1997	
41	Cevizli Yayla (2,000)		22–23 Aug. 1999	2,000–2,300
42	Tütüncüler Mezrası (1,250)	Alaca Mt. (2,844)	15–20 May 1995	
43	Çamdalı Yayla (1,700)	Karçal Mt. (3,414)	4–6 Aug. 2000	1,600–1,650
44	Beşağıl Yayla (2,000)		29 Aug.–2 Sep. 1996	
45	Çukunet Yayla (2,150)		9–10 July 2000	1,850–1,900
46	Çukur Yayla (2,100)		28–30 Nov. 1997	

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surveyed on foot, along predetermined transects with a view strip ranging from 50 m in forests to 500 m in the open. All signs were recorded on the 1:25,000 and 1:100,000 scale maps. The accounts of local hunters, villagers, shepherds and foresters were useful in the selection of some of the survey sites.

Signs of leopards, all footprints, were found at 16 sites, from Çitrik Gölü on the central Çapans Mountains to Çukunet Yayla on the Karçal Mountain in the east (Table 1 and Fig. 1). The first record was at Asağı Kavron Yayla in the Kaçkar Mountains at 1,750 m on 27 May 1995. The last record was at Dilberdüzü in the Kaçkar Mountains at 2,850 m on 20 September 2001 (Table 1). The signs indicate an almost continuous range for the leopard from the Ikizdere-Ispir highway in the centre to the border with Georgia in the east, a distance of approximately 250 km (Fig. 1). This range agrees with the reports of Kumerloeve (1956) who stated that leopard was recorded in the Hopa and Ispir provinces of the Eastern Karadeniz Region. There are also reports of leopard in neighbouring areas (Baytop, 1973; Huş, 1974; Gürpınar, 2000) and countries (Green, 1991; Richardson, 1992; Ullrich & Riffel, 1993; Khorozyan, 2001), and eyewitness accounts of a kill of a melanistic (black) leopard in Sukavuşumu, Yusufeli, in 1999. The altitudinal range of leopard footprints was 1,200–3,300 m, similar to that reported by Green (1991).

The leopard is probably the most adaptable of all the big cats, inhabiting dense forest, semi-desert, grasslands and mountainous regions (Richardson, 1992). The habitats in which we found leopard footprints ranged from pseudo-maquis (Eğribakacak Hill, 1,200 m, survey site 39) to dense forest (Çamdalı Yayla, 1,700 m, survey site 43), upper forest (Kito Yayla, 2,000 m, survey site 25), and the alpine zone (Adsiz Göl, 3,300 m, survey site 34) (Fig. 1). Many of the records were in the upper forest and alpine zones where snow persists for >6 months.

Green (1991) stated that leopards will tolerate snow but probably do not overwinter at high altitudes. We found evidence of the leopard in the upper forest and alpine zones in the spring, summer and autumn, and infer that they descend to lower altitudes, where prey will be more readily available, in winter. Potential prey includes chamois, wild goat, roe deer, wild boar, mountain hare and Caucasian black grouse *Tetrao mlokosiewiczi*. Of these, chamois, wild goat, hare and Caucasian black grouse are usually found between 2,000–3,500 m in summer (Baskaya, 1997). In addition, leopard shelter in the upper forest zones about 1,500–2,200 (−2,500) m, areas that have a low human population. There is limited information on the seasonal habitat use of leopards. However, it seems that the habitat use of the animal is strongly associated with the movements of its prey and human disturbance.

Because leopards are highly threatened in the region generally, and are believed by some to be extinct in Turkey, or to exist in numbers too small to be viable, and given the high biodiversity and conservation value of the whole region, it is important that further work be carried out to ascertain the size of the remaining leopard population in the Eastern Karadeniz Mountains. This will require the use of camera traps, which can be used to both confirm the existence of big cats such as leopard and estimate population sizes (Karanth & Nichols, 1998; Silver *et al.*, 2004).

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Biographical sketches

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Ertugrul Bilgili has particular interests in fire ecology and management, and the threatened animals of Turkey.

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