New records of the Anatolian leopard (Panthera pardus tulliana Valenciennes 1856) in Türkiye

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(Received 28 April 2022; accepted 17 July 2022)

Abstract
In this study, new records of the Anatolian leopard obtained in Türkiye after 2004 were presented. Many field studies were carried out in 37 provinces in Türkiye, from Kars in the far east to Edirne in the west, from Antalya in the south to Kastamonu in the north. Until 2013, footprints of the leopard were primarily used to indicate leopard presence, and in later studies, camera traps and thermal cameras were also used in addition to the footprints. As a result of the study, a total of 84 new records from 54 different localities were obtained from all regions except the Marmara region in Northwestern Türkiye. Most of the records were obtained from Northeastern (NE) Türkiye, where most field studies were carried out. A total of 84 new records are listed as follows; 66 footprints, 4 camera trap photos, 1 camera trap video, 3 thermal camera videos, 2 cell phone videos, 1 cell phone photo, 4 locals seen, 1 full skin, 1 death, and 1 fatal attack.

Keywords: Anatolian leopard, Panthera pardus tulliana, footprint, camera trap, thermal camera

Introduction
Although populations have become fragmented, leopards still occur throughout Africa with the exception of the Sahara Desert, from the Arabian Peninsula to Türkiye and across the southern half of Asia, and north through Eastern China to the land bordering the Amur River (Richardson 1992). P. p. tulliana subspecies, living and identified in 1856 in Türkiye, was incorrectly defined under P. p. saxicolor subspecies described in 1927 without any analysis by Miththapala et al. (1996). However, Kitchener et al. (2017) decided to collect these two subspecies that have the same characteristics under the name of P. p. tulliana. The number of subspecies of leopard living in the world is stated as eight in total in the taxonomic revision of the Felidae family (Kitchener et al. 2017). Also, Kitchener et al. (2017) stated that P. p. tulliana (Valenciennes 1856) included P. p. ciscaucasica (Satunin 1914) as well as P. p. saxicolor (Pocock 1927). The subspecies of leopard living in Türkiye is the Anatolian leopard (P. p. tulliana Valenciennes 1856) (Kumerloève 1956; Borner 1977; Kitchener et al. 2017; Sari et al. 2020).

In Türkiye, the status of leopards has been unclear. There are records from at least 1879, but records have been rare since the 1960’s. Most of the twentieth century data on leopards in west, south, and southeast Anatolia has been obtained from Kumerloève in Türkiye, and the total number of leopards in Anatolia was estimated to be 13–14 individuals in 1974 (Gürpinar 1974) and 15–23 individuals in 1978 (Goodwin & Holloway 1978). The records are from Amanos Mountain, Osmaniye, in 1879 (Kumerloève 1975), Gündoğmuş/Antalya, in 1925 (Anadolu Panteri 2017), Milas/Muğla, in 1928 (Anonymous 1953), Hatıpsılla Village/Aydın, in 1928 (Anonymous 1936), Karacahisar Village/Balıkesir, in 1928 (Anadolu Panteri 2017), Söke/Aydın, in 1936...
(Anonymous 1936), Seferhisar/İzmir, in 1936 (Anonymous 1936), Kova Lake/Isparta, in 1939 (Anadolu Panteri 2017), Kadirli/Osmaniye, in 1940 (Kumerloewe 1956), Çine/Aydın, in 1940 (Kayaöz 1999), Urla/İzmir, in 1942 (Anonymous 1946), Tatvan/Bitlis, in 1945 (Anadolu Panteri 2017), Çaykara, Trabzon, in 2014 (Sari 2018; Sari et al. 2020), İlçizada, Rize, in 2013, 2017 (Sari 2018; Sari et al. 2020), Çinar/Diyarbakır, in 2013 (Anadolu Ajans 2017), Yusufeli, Artvin, in 2014, 2015 (Sari 2018; Sari et al. 2020), Su Kavuşumu, Yusufeli, Artvin, in 2014, 2015, 2016, 2017 (Arpacık 2018), Camlıhemsin, Rize, in 2014, 2015 (Arpacık 2018), Yedisu/Bingöl, in 2015 (Sari 2018; Sari et al. 2020), İlçizada, Rize, in 2016 (Arpacık 2018), Şebinkarahisar/Giresun, in 2016 (Arpacık 2018; Sari 2018), Üzümlü/Erzincan, in 2016, 2017 (Sari 2018; Sari et al. 2020), Silopi/Şırnak, in 2018 (Karatas et al. 2021) and Antalya, in 2022 (Anonymous 2022).

After a leopard was shot in Ankara in 1974, however, there were many publications about the extinction of the leopard in the country, while only a few authors stated that the leopard was not extinct (Gürpinar 1974; Başkaya 2003; Başkaya & Bilgili 2004; Arpacık 2018; Sari 2018; Sari et al. 2020). Also, Can (2004) stated that the leopard shot in 1974 was probably an escaped animal from the Ankara Zoo, and that there is no hard evidence for the presence of leopards in the Turkish part of the Caucasus eco-region. Lukarevsky et al. (2007) did not confirm the presence of leopards in Northeastern (NE) Türkiye during a short field trip. Also, Lukarevsky et al. (2007) and Zimmerman et al. (2007) stated that the habitat in NE and Eastern Türkiye would, however, be suitable for the species, and the area remains interesting for further surveys – mainly the regions bordering Armenia and Iran – but more decisive and robust monitoring methods will be needed. Spassov et al. (2016) visited the region of the Eastern Black Sea for only 1 week between 18 and 26 August 2015 and did not confirm the presence of leopards during this short field trip along the roads.

There have, however, also been reports of leopard presence in Türkiye. For example, Başkaya and Bilgili (2004) found leopard footprints in 16 different locations in the Eastern Black Sea Mountains, where no records of leopards have been found since 1956. Arpacık (2018), Sari (2018) and Sari et al. (2020) presented presence data of the Anatolian leopard in Northeastern Anatolia including the Eastern Black Sea Mountains. To clarify leopard status in Türkiye, this paper summarizes existing records of the Anatolian leopard in the whole of Türkiye between 2004 and 2022 except for Arpacık (2018), Sari (2018), Sari et al. (2020), Karatas et al. (2021) and Anonymous (2022) and presents new data from trail cameras and thermal cameras confirming leopard presence.
Materials and methods

From 2004 to 2021, many field studies of 2–10 days were conducted focusing on the Anatolian leopard in all regions throughout Türkiye including Thrace and most extensively in NE Türkiye. We were also able to obtain evidence for leopards during the field studies on different subjects. Field studies were carried out in the cities of Edirne, Kırklareli, Istanbul, Balıkesir, Bursa in Marmara Region, Aydın, Muğla, Kütahya, Denizli in Aegean Region, Antalya, Mersin, Adana, Hatay, Kahramanmaraş in Mediterranean Region, Konya, Ankara, Eskişehir, Çankırı, Sivas in Central Anatolia, Bolu, Kastamonu, Çorum, Sinop, Tokat, Giresun, Trabzon, Rize, Gümüşhane, Artvin in Black Sea, Ardahan, Erzurum, Kars, Erzincan, Bingöl, Tunceli in Eastern Anatolia, and Şanlıurfa and Diyarbakır in Southeastern Anatolia.

While the Eurasian lynx (*Lynx lynx*) footprints were rarely encountered in studies carried out in Thrace, no sign of the leopard was detected. No signs were found in the provinces of Istanbul, Balıkesir, Bursa in Marmara; Aydın and Muğla in the coastal Aegean; Adana, Hatay, Kahramanmaraş in the Mediterranean; Konya, Ankara, Eskişehir in the Central Anatolia; Bolu, Sinop in the Western Black Sea; Şanlıurfa and Diyarbakır in the Southeast. Because the most suitable habitat for leopards is in NE Türkiye, this region had the highest amount of fieldwork followed by Western Black Sea, Marmara, Western Anatolia, Central Anatolia, Mediterranean and Southeastern Anatolia, respectively. For example, a total of 20 days of field studies was carried out in Aydın, Aegean region; 30 days in Antalya in the Mediterranean; 15 days in Bolu, 40 days in Sinop, 100 days in Kastamonu in the Western Black Sea; 25 days in Bingöl in the eastern; 150 days in Giresun on the Eastern Black Sea; only 5 days in Diyarbakır in the southeast.

Observations were carried out in many different habitats such as forest, high altitude forest, agricultural areas, river banks, rocky areas, steppe, subalpine and alpine zones in areas where there had been little human intervention. Direct and indirect observation methods were used during the field studies. Binoculars (10 × 42) and telescopes (20–60x) were used to scan likely habitat, and during field studies from 2004 to 2013, the footprints of the leopard were recorded as indicating leopard presence. After 2013, camera trap images and thermal camera images were also used in addition to direct observations and footprints. In addition, all potential leopard signs such as trails, scat, scratching, scraping, urine, food remains were recorded in all field studies, but not considered as definitive evidence for now. Because the samples identified as leopard hair in microscopic examinations and leopard feces in morphological examinations have not been evaluated as definitive evidence since they have not been subjected to DNA analysis yet. We also recorded and evaluated leopard skin from studying areas, reports from local people, seen notice, shooting and sighting records in Türkiye over recent years.

In areas where leopards had and had not been reported, two to four people scanned for their sign along a transect 20–50 meters apart, depending on the seasonal terrain. Observations of tracks and signs, especially footprints, were used to determine the existence of leopard. We measured the width and length of the footprints with a ruler and noted all details of toe pads (finger) and hind pads (heel) as well as shapes and every characteristic in the footprints. The only other cat species’ footprints to be confused with leopard in Türkiye is the Eurasian lynx. We differentiated leopard tracks from those of the Eurasian lynx based on size. Tracks of the Eurasian lynx are 4–7 cm long and 4.5–8 cm wide (Green 1991; Richardson 1992; Başkaya & Bilgili 2004; Van Maanen 2006; Sari et al. 2020). We considered tracks larger than 9 cm in length and width to be of the Anatolian leopard.

Following the field scanning, we used camera traps to obtain photos and video images of leopard. Some of the camera-traps were placed along established leopard trails on ridge tops and in deep valleys and river ecosystems to maximize capture probabilities over a large area only in Northeastern Anatolia. Trap locations were selected based on cues such as footprints, scats, scrapes, scratch marks. We also placed camera traps based on the design described by Karanth (1995) and York et al. (2001), side by side at randomly chosen trapping sites. We also obtained thermal video camera images taken during field scanning activities carried out by the Turkish security forces within the sampling areas and interviewed hunters and local people including shepherds about leopard presence.

Results

Since 2004, 84 new records were obtained from 54 different localities from all regions in Türkiye except Marmara and the coastal Aegean. These 84 new records were determined as a result of field studies and confirmed notices. Footprint records were obtained from 50 of the 54 localities. Of the 50 localities, 52 records were obtained based on only footprints, and 14 of them were based on both confirmed notices and footprints. Localities without
footprints are Kütahya, Şırnak and Sivas, where confirmed records were obtained and no field studies were conducted. The new records obtained were, respectively, 66 footprints, 4 camera trap photos, 4 seen by local people, 3 thermal camera videos, 2 cell phone videos, 1 camera trap videos, 1 cell phone photo, 1 full skin, 1 kill and 1 fatal attack. These new records were obtained from a wide geographical area in Türkiye, from Kars in the east to Kütahya and Denizli that are 1200 km away from the Inner Aegean in the west, from Antalya and Mersin in the south, to Kastamonu, approximately 600 km to the north. The distribution of both literature and new records of the Anatolian leopard are given on the map (Figure 1).

A total of 54 different record localities have been obtained from a total of 20 provinces. These provinces were 19 out of 37 provinces where field studies were carried out and in addition, Şırnak province where thermal camera records were obtained. Footprint records were also obtained from 12 localities where confirmed notices were obtained, except Kütahya/Çerte, Sivas/Sızır and Şırnak. In 9 provinces where unconfirmed notices were received, new records were obtained in different ways from those except Afyonkarahisar and Çorum.

Most of the records were obtained from NE Türkiye, where most field studies were carried out the most. No records of leopards could be obtained in five provinces in the Marmara region where field studies were conducted and in two provinces in the Southeastern Anatolia where little field study was conducted. However, thermal camera recording was obtained from Şırnak province, where no field study was conducted in the Southeast Anatolia. Of the 84 newly confirmed records, 71 of them were obtained during field studies as footprints and camera trap records (Table I).

The remaining 13 new records were confirmed notices, consisting of those seen by local people, full skin, cell phone photo or video taken by local people, thermal camera video, fatal attack by leopard and leopards killed by locals (Table II). Footprints were determined in 50 of the 54 localities, excluding the provinces of Kütahya/Çerte, Sivas/Sızır and Şırnak (Tables I and II).

Unconfirmed notices from local people, consisting of 9 seen by local people, and 2 killed by local people are given in Table III.

Although most of the records obtained from field studies were footprint records, 3 camera trap photos and 1 camera trap video from Giresun and one camera trap photo from Artvin province were also recorded. In addition, the confirmed records obtained from local people, including 2 thermal cameras, 2 cell phone videos, and 1 cell phone photo recordings, are other camera records.

Figure 1. Localities of the literature and new records of the Anatolian leopard in Türkiye.
Table I. Location of the Anatolian leopard records [Record type: Footprints, Camera Trap Photos (CTP) and Camera Trap Video (CTV)].

| No | Locality                          | Altitude (m) | Date          | Record Type |
|----|-----------------------------------|--------------|---------------|-------------|
| 1  | Ardahan, Bağdaşen                | 2300         | 9 July 2005   | Footprint   |
| 2  | Ardahan, Posof, Sarıcıçek         | 2000         | 10 September 2005 | Footprint   |
| 3  | Ardahan, Yeniköy                 | 2100         | 20 August 2006 | Footprint   |
| 4  | Erzurum, İspir, Karakale          | 1600         | 25 August 2008 | Footprint   |
| 5  | Bingöl, Kış, Topraktık           | 1400         | 13 March 2009  | Footprint   |
| 6  | Antalya, Alanya, Bucak           | 700          | 24 March 2009  | Footprint   |
| 7  | Erzurum, İspir, Sirakonak         | 1150         | 26 May 2009    | Footprint   |
| 8  | Kastamonu, Şenpazar, Furuncık     | 1200         | 17 July 2009   | Footprint   |
| 9  | Denizli, Honaz Dağı National Park| 1500         | 26 July 2009   | Footprint   |
| 10 | Ardahan, Posof, Erim             | 1700         | 9 August 2009  | Footprint   |
| 11 | Gümüşhane, Artabel Gölleri Nature Park | 2300 | 15 November 2009 | Footprint |
| 12 | Antalya, Alanya Çeltek         | 800          | 6 March 2010   | Footprint   |
| 13 | Trabzon, Maçka, Akarsu, Tekmezat| 1500         | 2 April 2010   | Footprint   |
| 14 | Kastamonu, Azdavay, Zümürt      | 1300         | 20 June 2010   | Footprint   |
| 15 | Erzurum, İspir, Özlüce           | 1500         | 20 September 2010 | Footprint |
| 16 | Çankırı, Ilgaz, Çomar            | 1600         | 10 July 2011   | Footprint   |
| 17 | Kastamonu, Taşköprü, Yaralıgöz Mt.| 1400      | 28 August 2011 | Footprint   |
| 18 | Erzincan, İliç, Kayacık          | 900          | 19 April 2012  | Footprint   |
| 19 | Giresun, Şebinkarahisar, Eskine Yayılası | 1900 | 15 May 2012    | Footprint   |
| 20 | Kar, Kağızman, Madur Mt.         | 1500         | 12 August 2012 | Footprint   |
| 21 | Kütahya, Simav, Ilıamlar         | 1100         | 19 October 2012 | Footprint   |
| 22 | Erzurum, Çat, Kumaoğlu          | 1800         | 20 October 2012 | Footprint   |
| 23 | Mersin, Kadınca Wildlife Res. Area | 1000        | 22 December 2012 | Footprint |
| 24 | Arıvit, Yusufeli, İşhan         | 1500         | 28 December 2012 | Footprint |
| 25 | Trabzon, Uzungöl, Dorinör Mezrası | 1750        | 12 May 2013    | Footprint   |
| 26 | Arıvit, Meydancık, Taşköprü Yayılası | 2000       | 22 May 2013    | Footprint   |
| 27 | Rize, Çamlıhemsin, Huser Yayılası | 2400         | 5 November 2013 | Footprint   |
| 28 | Trabzon, Çaykara, Demiri       | 1400         | 30 June 2014   | Footprint   |
| 29 | Gümüşhane, Şiran, Yuvarı Kulaca   | 2000         | 23 November 2014 | Footprint |
| 30 | Giresun, Dereli, Aksu           | 1500         | 28 June 2015   | Footprint   |
| 31 | Arıvit, Ardanuc, Meşeköy       | 1500         | 5 July 2015    | Footprint   |
| 32 | Tokat, Reşadiye, Çakmak         | 600          | 28 August 2016 | Footprint   |
| 33 | Arıvit, Yusufeli, Hastaf Yayılası| 2400         | 6 August 2017  | Footprint   |
| 34 | Arıvit, Ardanuc, Meşeköy         | 1500         | 10 September 2017 | Footprint   |
| 35 | Trabzon, Uzungöl, Filah         | 1050         | 15 December 2017 | Footprint   |
| 36 | Giresun, Çamoluk, Gürçali        | 1400         | 4 February 2018 | Footprint, CTP |
| 37 | Trabzon, Maçka, Taşköprü Yayılası | 1600        | 22 April 2018  | Footprint   |
| 38 | Trabzon, Köprübaşi, Kahvedüzü Yayılası | 1000 | 10 June 2018 | Footprint   |
| 39 | Giresun, Çamoluk, Gürçali       | 1300         | 25 September 2018 | Footprint, CTV |
| 40 | Erzurum, İspir, Yedigöller      | 3200         | 14 October 2018 | Footprint   |
| 41 | Bingöl, Yedisu                 | 1500         | 5 July 2019    | Footprint   |
| 42 | Trabzon, Çaykara, Uzunartla Mezrası | 2000     | 7 July 2019    | Footprint   |
| 43 | Giresun, Çamoluk, Gürçali       | 1200         | 5 August 2019  | Footprint, CTP |
| 44 | Giresun, Şebinkarahisar, Tepeltepe| 1200        | 31 August 2019 | Footprint   |
| 45 | Giresun, Çamoluk, Gürçali       | 1300         | 4 April 2020   | Footprint, CTP |
| 46 | Giresun, Şebinkarahisar, Yankca  | 900          | 8 June 2020    | Footprint   |
| 47 | Trabzon, Çaykara, Celepçayı Mezrası | 2050     | 4 July 2020    | Footprint   |

(Continued)
Table I. (Continued).

| No | Locality                  | Altitude (m) | Date            | Record Type |
|----|----------------------------|--------------|-----------------|-------------|
| 48 | Tunceli, Püllümür, Üçdam  | 1400         | 19 July 2020    | Footprint   |
| 49 | Giresun, Çamoluğ Gürçali  | 1350         | 5 December 2020 | Footprint   |
| 50 | Trabzon, Uzungöl           | 1150         | 20 December 2020| Footprint   |
| 51 | Artvin, Yusufeli, Demirdöven | 2000     | 26 December 2020| Footprint   |
| 52 | Trabzon, Uzungöl           | 1150         | 13 January 2021 | Footprint   |
| 53 | Trabzon, Çaykara, Multat Yaylası | 1600    | 13 January 2021 | Footprint   |
| 54 | Artvin, Yusufeli, Demirdöven | 2000     | 12 February 2021| Footprint   |
| 55 | Artvin, Yusufeli, Demirdöven | 1800     | 15 February 2021| Footprint, CTP|
| 56 | Artvin, Yusufeli, Demirdöven | 1700     | 13 March 2021   | Footprint   |
| 57 | Trabzon, Uzungöl           | 1150         | 3 July 2021     | Footprint   |

Table II. Confirmed notices of the leopard from local people and Turkish Security Forces [Record type: Footprints (FP), Cell phone photo (CPP) and Cell phone video (CPV), Thermal camera video (TCV)].

| No | Locality                  | Altitude (m) | Date            | Record Type |
|----|----------------------------|--------------|-----------------|-------------|
| 1  | Sivas, Gemerek, Sızur     | 1500         | 1993            | Fatal attack|
| 2  | Artvin, Yusufeli, Kılçıkaya | 1000     | 17 May 2007     | Full skin and FP|
| 3  | Giresun, Şebinkarahisar, Eskine Yaylası | 1900    | 2013            | Seen by locals and FP|
| 4  | Artvin, Ardanuç, Meşketöy  | 1500         | 5 March 2014    | Seen by locals and FP|
| 5  | Trabzon, Çaykara, Uzuntarla Mezarı | 2000    | 26 June 2016    | Killed by locals and FP|
| 6  | Şırnak                     | ~1000        | 17 August 2017  | TCV         |
| 7  | Trabzon, Uzungöl, Filah   | 1050         | 10 December 2017| Seen by locals and FP|
| 8  | Erzincan                  | ~1200        | 29 March 2019   | TCV and FP  |
| 9  | Kütahya, Emet, Çerte      | 1100         | 5 May 2019      | CPV taken by locals|
| 10 | Trabzon, Maçka, Yazlık    | 1200         | 4 November 2019 | Seen by locals and FP|
| 11 | Trabzon, Uzungöl           | 1150         | 2 July 2020     | CPV taken by locals and FP|
| 12 | Artvin, Yusufeli, Demirdöven | 1700     | 24 December 2020| CPP taken by locals and FP|
| 13 | Şırnak, Cudi Dağı, Habis Tepe | ~2100   | 17 November 2021| TCV         |

Table III. Unconfirmed notices of the leopard from local people.

| No | Locality                  | Altitude (m) | Date            | Record Type |
|----|----------------------------|--------------|-----------------|-------------|
| 1  | Ardahan, Posof, Sesödile Mt. | 2100        | 1966            | Seen by locals|
| 2  | Sivas, Divriği             | 1500         | 1980            | Killed by locals|
| 3  | Kars, Kağızman, Çemçe Mt.  | 1800         | 2005            | Seen by locals|
| 4  | Giresun, Şebinkarahisar, Asarcık | 1600    | 2005            | Seen by locals|
| 5  | Erzincan, Çayır, Başköy   | 1900         | 2010            | Seen by locals|
| 6  | Kars, Kağızman, Madır Mt, Görecek | 1700    | 2010            | Seen by locals|
| 7  | Afyonkarahisar, Dinar, Eldere | 1000    | 2010            | Seen by locals|
| 8  | Giresun, Şebinkarahisar, Şaphça | 1600    | 2013            | Seen by locals|
| 9  | Tokat, Reşadiye, Altiparmak | 700         | 20 May 2014     | Seen by locals|
| 10 | Çorum, Karg, Abdullah      | 1500         | 20 October 2015 | Seen by locals|
| 11 | Gümüşhane, Camiboğazı Yaylası | 2300        | 5 September 2020| Killed by locals|
We obtained three thermal camera videos recorded by Turkish security forces. In the one recorded from Şırnak in 2017, the leopard’s distance was about 107 m to the thermal camera. The screenshots taken from the thermal camera video have the leopard walking alongside a water buffalo with the leopard’s body structure such as body length, shoulder height and tail are clearly visible (Figure 2).

Another thermal video obtained by Turkish security forces was recorded in Erzincan provinces in 2019. The leopard was about 200 m away from the thermal camera (Figure 3), and in the screenshots taken from the thermal camera video, the body structure, tail and neck of the leopard can be clearly seen. In the original video recording, the body structure and characteristic movements of the leopard can be distinguished more clearly.

The last thermal video obtained from Turkish security forces was recorded in Şırnak provinces from Cudi mountain (Habis Tepe) in November 2021. The leopard’s distance from the camera was about 50 m (Figure 4). In these screenshots taken from the thermal camera video, the body structure, tail, and rosettes of the leopard can be clearly seen. The sex of the recorded leopard is difficult to determine as the testicles are not clearly visible.

In addition to the images, 66 footprints above 9 cm in diameter belong to the Anatolian leopard were obtained different times from all study areas given in Tables I and II (Figure 5).

Besides these, there was one full skin (Figure 6), one kill, and one fatal attack record among the confirmed records obtained from local people.

One of the most interesting records here was a fatal attack in Sivas province in 1993, long before 2004. This fatal attack information was given by the general practitioner (today Surgeon Prof), who took part in the treatment process of a middle-aged male who was treated for a long time due to serious wounds and regained his health.

Discussion

There are many records showing that leopards have lived in a large part of Türkiye from past to present. Especially in publications published after 1990, leopard records came from the Eastern Black Sea, Eastern Anatolia, Southeastern, Western Black Sea and Mediterranean Regions (Ullrich & Riffel 1993; Kayaöz 1999; Başkaya 2003; Başkaya & Bilgili 2004; Üstay 2008; De Marinis & Masseti 2009; Başkaya et al. 2011, 2012; Anadolu Panteri 2017; Anadolu Ajansı 2017; Arpacık 2018; Sari 2018; Toyran 2018; Sari et al. 2020). Despite this, there were some who claimed that there is no hard evidence that the leopard was still present in Türkiye (Can 2004; Breitenmoser et al. 2010). Furthermore, Can (2004) claimed that the leopard did not live in the north as well and that the records in Başkaya and Bilgili (2004) could be lynx or something else. Similarly, Lukarevsky et al. (2007) did not confirm the presence of leopards in NE Anatolia. However, in the same year, a team including
Lukarevsky et al. (2007) stated that NE Türkiye is the potential habitat of the leopard (Zimmerman et al. 2007). Khorozyan (2008) stated that leopards in Türkiye are probably transboundary migrants, exists in a small area bordering Southeastern and Northeastern Türkiye. In this study, however, we confirmed leopard presence from trail camera photos, thermal camera footage, cell phone photos, footprints as well as leopards killed by locals, primarily in Northeastern Türkiye but also many other areas except Thrace.

Başkaya and Bilgili (2004), Arpacık (2018), Sari (2018) and Sari et al. (2020) stated that the leopard is found in NE Türkiye. Many records, mostly new, were obtained in almost all localities in 9 provinces where leopard was recorded from NE Türkiye by Arpacık (2018), Sari (2018) and Sari et al. (2020). In the western part of Türkiye, where more
fieldwork has been done in number and days, there are no records in the Thrace region. Footprints were found, however, in the inner Aegean and the Mediterranean, where less fieldwork was done. This situation suggests that the presence of the leopard in the Inner Aegean and the Mediterranean is much better than what has been detected. Here, the footprints found in dense forests in the Western Black Sea where it is very difficult to find footprints are also very valuable.

Our study also confirms the importance of border areas for leopards in Türkiye. The leopard was thought to exist only in the Southeastern tip of Türkiye in a narrow area bordering Iran and Iraq (Jacobson et al. 2016; Sanei et al. 2016; Khorozyan et al. 2017; Parchizadeh & Adibi 2019), and leopards are shown to be extant in a very narrow area just on the other side of the border in Nakhchivan and Armenia territories (Khorozyan et al. 2008, 2010, 2017; Jacobson et al. 2016). Also, Sanei et
al. (2020) indicates that the corridor from Iran to Azerbaijan and Armenia supports the presence of leopards in the Caucasus. However, all these studies consider that there are no leopards in Türkiye. In fact, the Caucasian populations in the north are likely to support each other with the transitions between Türkiye, Georgia, Armenia and Nakhichevan. Even in the north, it is highly likely that there is a connection between Türkiye, Georgia and Russia. It is natural that there are migrations in the border regions, but we believe that these migrations are also made mutually between countries. More data is necessary on transboundary leopard movements between countries, and our study shows the potential importance of thermal video footage from border security personnel.

Based on our records and field experience so far, although the leopard has decreased in the past years, it has never been extinct in many regions of Türkiye. Especially in the last 20–30 years, it seems to have increased considerably as a positive result of the increase in prey and consciousness level. There is a considerable number of leopards in the country, although the existence of the species in the country is disputed without fieldwork knowledge.

Despite many records, it was assumed by experts and government officials that the leopard disappeared in the country because they could not see the color photograph or video. Until now, our leopard projects in the whole country or in certain regions have not been supported by the state, as the leopard is believed to be extinct by almost all the experts and bureaucrats in the country. After the new records presented in this study, more detailed results can be obtained if the studies on leopard are supported.

Acknowledgements

This research received no specific grant from any funding agency or commercial or non-profit sectors. We would like to thank the Turkish security forces for whom we provided thermal camera video records, which contributed immensely to this study. Also, we are particularly grateful to Edva Tuna PİRSELİMOĞLU who is the chairman of the Eastern Karadeniz Hunting Federation for participating immensely in our field studies, and surgeon Prof. Dr. Alptekin YASIM for the information about fatal attack of leopard in 1993.

Disclosure statement

No potential conflict of interest was reported by the authors.

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