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Conservation of a new breeding population of Caucasian lynx (*Lynx lynx dinniki*) in eastern Turkey

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Abstract: Current data on the distribution and ecology of the Eurasian lynx (*Lynx lynx*) in Turkey are limited. Furthermore, lynx in the Caucasus region are likely to represent a subspecies of the Eurasian lynx, the Caucasian lynx (*L. l. dinniki*). Throughout its range, lynx increasingly face threats due to human activity, with habitat loss and prey depletion being of particular concern in eastern Turkey. As part of our camera trapping efforts to monitor large carnivores in the Sarıkamış-Allahuekber National Park and surrounding forests in Kars and Erzurum provinces, eastern Turkey, we have documented a breeding population of Caucasian lynx outside the species' published range. In addition to the threats above, vehicle strikes, poaching, and guardian dogs also threaten this small population. There is an urgent need for ecological research, awareness raising, and community-based conservation efforts focused on large carnivores in the region.

Key words: Anatolia, camera trapping, carnivore, cats, Caucasus biodiversity hotspot, human-wildlife conflict, threatened species

The Eurasian lynx (*Lynx lynx*) is a widely distributed species in Asia and Europe, relying on adequate forest cover and a sufficient prey base for its survival (Aulagnier et al., 2009). Historically, lynx inhabited a much larger region including many areas throughout western Europe; however, habitat loss and human activity has fragmented the population into isolated remnants in many parts of its range and some isolated European subpopulations are critically endangered or endangered (Breitenmoser et al., 2008). While lynx have been successfully reintroduced to several areas of central and western Europe (Kaczensky et al., 2013), habitat availability and human-carnivore conflict continue to be critical barriers to their success in many areas. As a result, habitat constraints and limited connectivity between Eurasian lynx populations have resulted in high levels of genetic differentiation in parts of their western range (Ratkiewicz et al., 2012). In some cases, isolated populations have been recognized as subspecies of lynx, leading to the designation of discrete, demographically independent populations. The lynx in eastern Turkey are considered a subspecies of Eurasian lynx known as the Caucasian lynx, *Lynx lynx dinniki* (von Arx et al., 2004; Albayrak, 2012), are considered endangered (Price, 2000), and are in need of a conservation-breeding program (von Arx et al., 2004).

For a temperate region, Turkey has an impressive assemblage of large mammalian carnivores, including lynx, caracal (*Caracal caracal schmitzi*), leopard (*Panthera pardus tulliana*), Eurasian brown bear (*Ursus arctos arctos*), gray wolf (*Canis lupus lupus*), and striped hyena (*Hyaena hyaena*), with Persian lion (*Felis leo persica*), tiger (*Panthera tigris virgata*), and Asiatic cheetah (*Acinonyx jubatus venaticus*) having gone extinct in the past two centuries (Şekercioğlu et al., 2011a). However, Turkey's biodiversity is in crisis (Şekercioğlu et al., 2011a, 2011b), Turkey's carnivores are understudied, and, illustratively, little is known about the distribution and ecology of lynx in eastern Turkey. These medium-sized cats are elusive animals that are rarely seen in the wild. Recent camera trapping projects and surveys have generated records of lynx in some provinces (Ambarlı et al., 2010; Albayrak, 2012) and neighboring countries in which they had not previously been sighted/recorded (Moqanaki et al., 2010 and references therein). While the distribution and status of lynx in Turkey are data-deficient, we think that the fragmentation of forest, depletion of prey base, poaching, and vehicle collisions represent significant threats to this understudied subspecies. Due to its geographic isolation, the population of *L. l. dinniki* in eastern Turkey could potentially represent an evolutionarily significant unit in need of detailed research (Moritz, 1994).

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Since 2006, our camera trapping study has been operational in the Sarıkamış-Allahuekber Mountains National Park and surrounding forests in eastern Turkey's Kars Province. Forest cover on this high elevation plateau is dominated by Scots pine (*Pinus sylvestris* var. *hamata*), but it is extremely fragmented due to human agricultural activity. Legal logging occurs on about 85% of the ~328 km² forest and illegal timber poaching is widespread (Şekercioğlu, 2012). Most notably, our study site is located more than 100 km from the nearest lynx locality in the IUCN Red List distribution map (Breitenmoser et al., 2008; Figure 1). Our camera trap survey has documented 15 mammal species, including the Caucasian lynx. Regular photographs of lynx from 9 months of the year provide concrete evidence to expand the known distribution

of lynx in Turkey. Several of our photos document lynx with cubs, the first photographic evidence of a breeding population of lynx in the area (Figure 2a). In our most recent survey with 13 camera traps over approximately 3 months (1351 trap-nights), we had 8 instances of 5 distinct individuals recognized by unique pelage.

Our discovery suggests that the Sarıkamış-Allahuekber National Park and the surrounding forest is a refuge for predators in a highly fragmented landscape dominated by human activity. Therefore, protecting these forests and connecting them to the bigger forests in the north with Turkey's first wildlife corridor (Şekercioğlu, 2012) are of vital importance to the conservation of large carnivore populations, including the Caucasian lynx and other feline species. In 2010, our camera trap survey documented

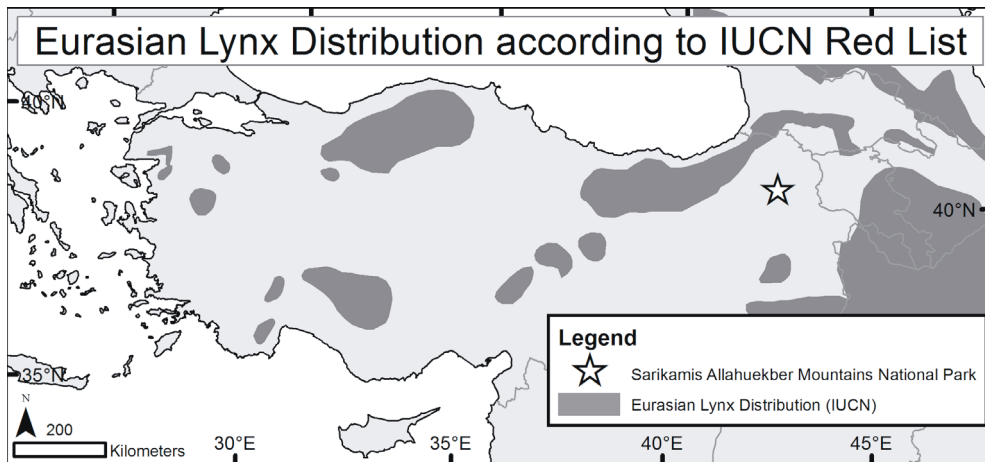


Figure 1. IUCN distribution of Eurasian lynx (*Lynx lynx*) in Turkey shaded in black with the Sarıkamış-Allahuekber Mountains National Park represented with a white star (Breitenmoser et al., 2008). KuzeyDoğa's work focuses on the national park and surrounding areas, where we have documented a breeding population of lynx.

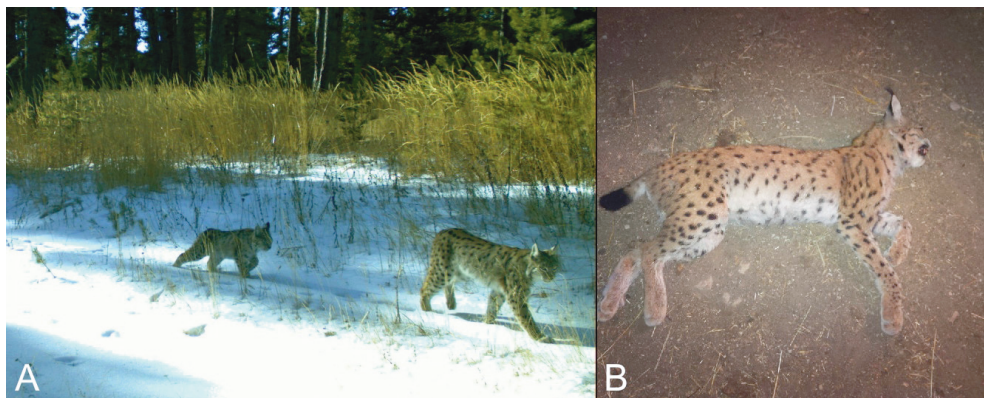


Figure 2. (A) Camera trap photo from the KuzeyDoğa Society's ongoing camera trap project in eastern Turkey, focusing on the Sarıkamış-Allahuekber Mountains National park and the surrounding forest. This is the first photographic evidence of a breeding lynx population in the area. (B) A lynx killed by a vehicle collision in fall 2013.

wild cats (*Felis sylvestris sylvestris*) for the first time in the region. Nearby, the Aras River watershed harbors jungle cats (*Felis chaus chaus*). Leopards have also recently been recorded in all the countries neighboring northeastern Turkey (i.e. Georgia, Armenia, Azerbaijan (Nakhchivan), and Iran (Khorozyan and Abramov, 2007; Ghoddousi et al., 2010)) and may survive in the rugged Arpaçay Canyon and Aras River military zones, which form the Turkey–Armenia border and are off limits to the public.

Like most large carnivores, lynx require large areas and are particularly susceptible to threats directly related to human activity (Ripple et al., 2014). Illegal skin trade has been identified by the IUCN as the biggest threat to the Eurasian lynx, followed by habitat loss and prey depletion (Breitenmoser et al., 2008). In eastern Turkey, all three of these threats exist. However, habitat loss and prey depletion may play a proportionately larger role in limiting lynx populations. Agricultural activities, mainly livestock grazing, are decreasing forest cover, which is necessary for lynx and their prey to survive. In many areas that lynx inhabit, ungulates are considered a primary food source. However, evidence of roe deer from camera trap surveys and scat surveys in the region is extremely rare. Out of 3827 trap nights at 25 camera trap stations in the Sarıkamış forest over 8 years, we documented a maximum of 5 roe

deer in only 41 photos. Lynx are also killed regularly in eastern Turkey by vehicle collisions, poaching, and sheep dogs (Figure 2b). A collaboration between the University of Utah and the KuzeyDoğa Society, our wildlife conservation ecology project is being carried out with the hope of contributing to the growing conservation movement in Turkey and improving carnivore conservation in the region. We strongly recommend detailed research on the behavior, distribution, genetics, ecology, and population biology of the Caucasian lynx in eastern Turkey to better understand the geographic range, population trends, and threats to this distinct population of lynx.

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