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# Striped Hyena, *Hyaena hyaena* (Linnaeus, 1758) (Carnivora: Mammalia), Distribution, Threats and Conservation Recommendations in Batman Province

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## ABSTRACT

The striped hyenas, *Hyaena hyaena* (Linnaeus, 1758), are listed as Near Threatened (NT) category globally, while they are listed as Vulnerable (VU) category in Türkiye according to the IUCN (The International Union for Conservation of Nature). In this study, which was carried out between 2020 and 2023, it is aimed to determine the presence of striped hyenas, their distribution areas, threats to the species, and present conservation recommendations in Batman Province. Direct and indirect observations were made during all four seasons in 104 locations determined by interviews with hunters, shepherds, and local people, and camera traps were set up in these locations. The presence of striped hyenas was determined in 20 different localities of Batman Province. Threats to this species were determined during the observations, and protection recommendations were presented. This study is the most comprehensive research to date on the distribution of striped hyenas in a province in Türkiye.

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# Çizgili Sırtlan, *Hyaena hyaena* (Linnaeus, 1758) (Carnivora: Mammalia), Batman İlindeki Dağılışı, Türe Yönelik Tehditler ve Koruma Önerileri

## ÖZET

Çizgili sırtlan, *Hyaena hyaena* (Linnaeus, 1758), IUCN (Dünya Doğa ve Doğal Yaşamı Koruma Birliği)'ne göre küresel ölçekte Tehdite Yakın (NT) kategorisinde listelenirken Türkiye'de Hassas (VU) kategorisinde listelenmektedir. 2020-2023 yılları arasında gerçekleştirilen bu çalışmada Batman ili sınırları içerisinde çizgili sırtlanın varlığının, yayılış alanlarının, türe yönelik tehditlerin belirlenmesi ve koruma önerilerinde bulunulması amaçlanmıştır. Avcılar, çobanlar ve yöre insanları ile yapılan görüşmeler sonucunda belirlenen 104 lokasyonda dört mevsim süresince belirli aralıklarla doğrudan ve dolaylı gözlemler gerçekleştirilmiş ve fotokapanlar kurulmuştur. Çalışma sonucunda Batman ilindeki 20 farklı lokalitede çizgili sırtlan varlığı tespit edilmiştir. Gözlemler süresince türe yönelik tehditler belirlenerek koruma önerileri sunulmuştur. Bu çalışma, Türkiye'de bir ildeki çizgili sırtlanların yayılışları ile ilgili şu ana kadar yapılmış en kapsamlı araştırmadır.

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## INTRODUCTION

Türkiye serves as an ecological bridge between Europe, Africa, and Asia, and is home to three of the 36 global biodiversity hotspots (Noroozi et al., 2019), namely the Mediterranean, Caucasus, and Iran-Anatolia. The flora and fauna of Türkiye, which has a very rich biodiversity compared with its neighbours, has adapted to these three continents (Akman, 1999; Eken et al., 2006; Kaya et al., 2011; Çağatay et al., 2012; Ambarlı et al., 2016). Mammals

represent the most diverse class of animals on Earth, encompassing 6399 species across 27 orders, 167 families, and 1314 genera (Musser & Carleton, 2005). Within the Palearctic region alone, there are 843 species distributed across 13 orders and 42 families. While Europe is home to about 200 mammal species, about 170 mammal species belonging to 9 orders (Eulipotyphla, Chiroptera, Lagomorpha, Rodentia, Cetacea, Carnivora, Pinnipedia, Perissodactyla and Artiodactyla) are distributed in Türkiye (Wilson & Reeder, 2005; Eken et al., 2006; Kaya et al., 2011; Özkazanç, 2017; Selçuk and Kefelioğlu, 2020; Seyfi et al., 2021). Hyaenidae, one of the six carnivore families distributed in Türkiye, is represented by four species (*Crocuta crocuta*, *Proteles cristata*, *Hyaena brunnea,* and *Hyaena hyaena*) in the world (Albayrak et al., 1997, 2008; Leakey et al., 1999; Koepfli et al., 2006; Yıldırım, 2010; Atay et al., 2017; Kılıç, 2018). *Hyaena hyaena* (Linnaeus, 1758), listed as Near Threatened (NT), in IUCN Red List of Threatened Species, has a very wide distribution from Africa, including much of eastern and northeastern Africa, south to central Tanzania, the Middle East and the Arabian Peninsula, Türkiye, the Caucasus, Central Asia, and the Indian subcontinent (Rieger, 1981; Mills & Hofer, 1998; Wagner, 2006; Yıldırım, 2010). There are five recognized subspecies of striped hyenas (*H. h. hyaena*, *H. h. barbara*, *H. h. dubbah*, *H. h. sultana,* and *H. h. syriaca*) that exclusively inhabit semi-deserts, steppes, rocky areas, and sparsely forested valleys. Of these, only *H. h. syriaca* is distributed in Syria and the Caucasus along with Anatolia (Rieger, 1981; Mills & Hofer, 1998; Singh, 2008). Despite their wide distribution, there are very few studies on the population status and ecology of striped hyena (Abi-Said & Abi-Said, 2007; Alam et al., 2015; Wagner, 2006). The first study on their distribution in Türkiye was conducted by Kumerloeve (1967), who reported that the species was almost extinct in Türkiye. It would seem that the limited research on the distribution of the species in Türkiye is relatively contemporary, which serves to underscore the local endangered status of the species (Özkurt et al., 1998; Kasparek et al., 2004; Akay et al., 2010; Yıldırım, 2010; Kılıç, 2018; Çoğal et al., 2021). Human-induced factors are threated (Leakey et al., 1999; Wagner, 2006; Kılıç, 2018), the species is classified as "Near Threatened" (AbiSaid and Dloniak, 2015) on the IUCN red list globally, it is listed as "Vulnerable" (Jdeidi et al., 2010) in the Mediterranean Basin, including Türkiye. To date, no comprehensive research has been conducted on the local distribution of striped hyenas in Southeastern Anatolia. The aim of this study was to determine the distribution areas of striped hyenas in Batman province and to reveal the threats to the species and the measures that can be taken against these threats.

## MATERIAL and METHOD

### Study area

Batman province is located at 41°10′-41° 40′E and 38° 40′-37°50′ N, and has a continental climate. The annual average temperature of Batman province is 16.7 °C. The annual average rainfall is 530 mm. The altitude of the province is approximately 550 meters, and the north and northeast of the province are covered with high mountains and forested areas, but the areas in the south are flatter and steppe. The highest mountains of the province are Mereto Mountain with an altitude of 2973 meters and Sason Mountains with an altitude of 2500 meters. Dicle River, Batman, Sason, Garzan, and Pisiyar Streams are important rivers of the province.

### Method

In this study, direct and indirect observations (camera traps, interviews, footprints, feces, etc.) were conducted at regular intervals during four seasons to determine the distribution areas of striped hyenas in Batman province between 2020 and 2023. Based on interviews with hunters, shepherds, local people living in rural areas, and preliminary field studies on habitat localities have been determined where the striped hyena is likely to be distributed. Spypoint Force-20 camera traps were used in this study. These camera traps are equipped with 48 low-glow LEDs and 20 megapixels resolution and have 24 24-meter flash range, 21 21-meter detection range, color by day, infrared by night photo type, up to 5 images per capture, and 0,7 second trigger speed. Fifteen camera traps were set up at 104 different localities during the fieldwork (Figure 1). Each camera trap was left in the field for at least 15 days in each season.

## RESULTS

The presence of striped hyena was recorded in 20 of the 104 localities where camera traps were set up in Batman province. Of the 20 localities where the striped hyena was detected, one was an active striped hyena nest, four were interviews with local people, four were dead individuals, and eleven were detected using camera traps (Table 1). The striped hyenas in the camera trap images were examined according to the patterns on their bodies, and those with different patterns were counted as individuals (Figure 2).

Eighteen of the localities where striped hyenas were detected are located within the Tigris Valley Important Nature Area (approx. 1355 km$^2$), which covers the districts of Hasankeyf and Gercüş in the southern part of Batman province (approx. 1000 km$^2$) (Figure 3).

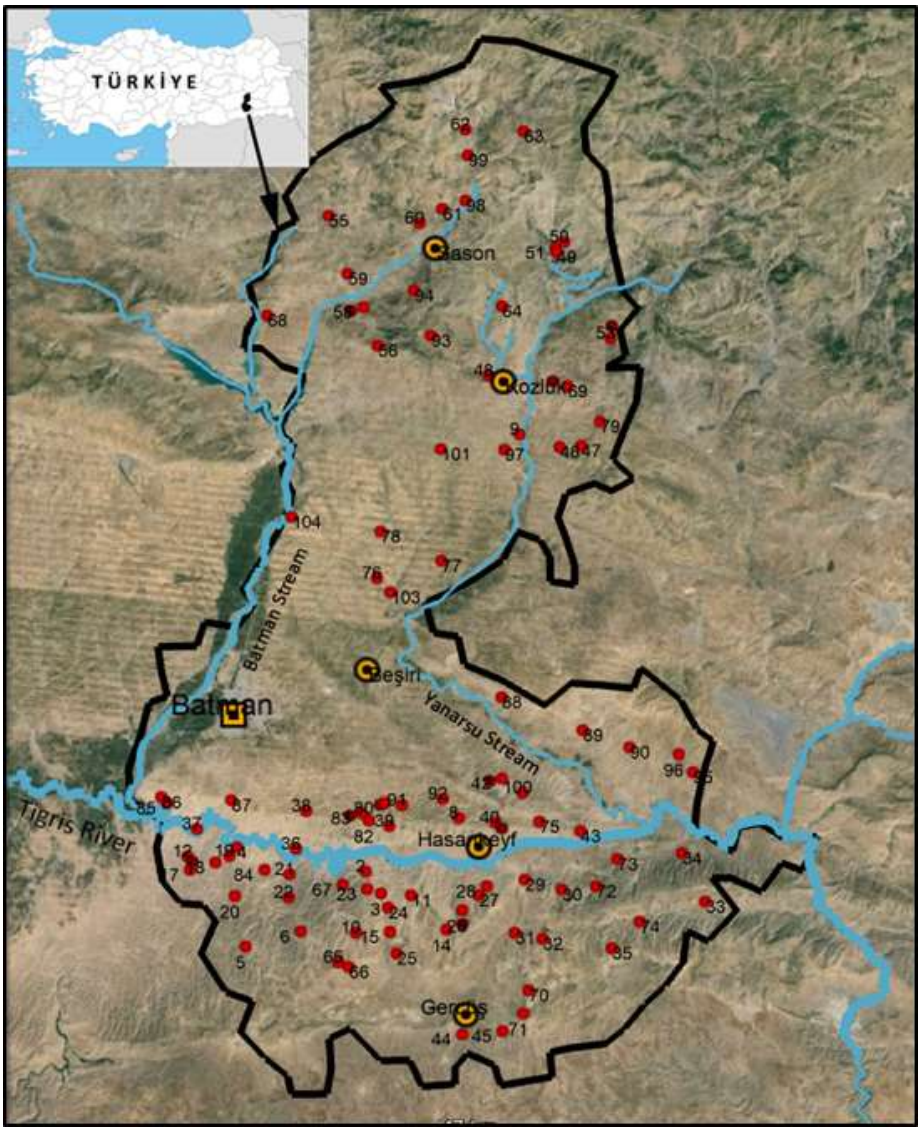


Figure 1. Observation points of the striped hyena in the Batman province.
*Şekil 1. Batman ilinde çizgili sırtlanın gözlem noktaları.*

Table 1. Detection method of striped hyena and detected number of individuals.
*Çizelge 1. Çizgili sırtlan tespit yöntemi ve tespit edilen birey sayısı.*

| Detection method | Number of individuals |
|---|---|
| Nest | 1 |
| Interview | 4 |
| Dead | 4 |
| Camera trap | 11 |
| **TOTAL** | **20** |

Striped hyenas have been found to use natural caves in valleys within the Tigris Valley Important Nature Area, which includes the Tigris River, as nests. When the hours of activity of the striped hyena were examined, it was determined that it is not active between 09.00 and 18.00, with its most intense activity occurring between 18.00 and 06.00 after dark in the evening. It is thought that striped hyenas prefer to stay in their nest due to human activities throughout the day.

It was determined that the most important factor threatening the striped hyena is road kills (three of the four individuals). In addition, direct or indirect human-induced threats, such as the decrease in their habitat due to the expansion of human settlements and agricultural areas, the decrease in the number of animals they prefer as food, the decrease in the number of other large carnivores that leave food remains, and environmental pollution.

In addition, it was determined that the striped hyena with an injured leg, which was captured by a camera trap in

its nest near Kesiktaş village, died by sticking into oil waste approximately 5,500 meters away from its nest (Figure 4).

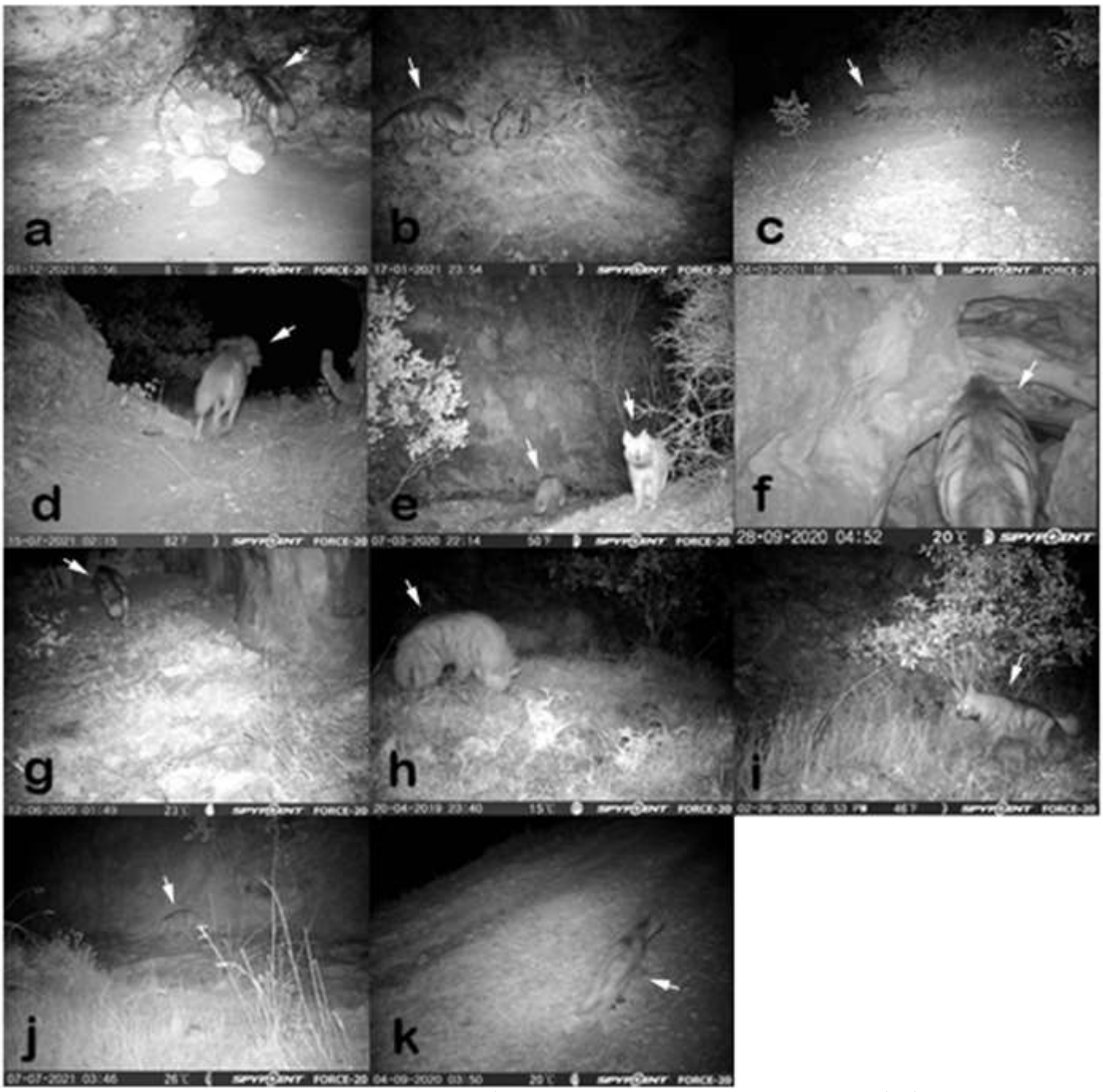


Figure 2. Camera trap images of striped hyena (The arrow indicates the striped hyena). (a.Kesikağaç village, b.Kumluca village, c.Mağaralı village, d.Kantar village, e.Kömürcü village, f.Aksu village, g.Kışlak village, h.Akarca village, i.Boğazköy village, j.Çardaklı village, k.Palamut village).

*Şekil 2. Çizgili sırtlan fotokapan görüntüleri (Ok çizgili sırtlanı göstermektedir). (a.Kesikağaç köyü, b.Kumluca köyü, c.Mağaralı köyü, d.Kantar köyü, e.Kömürcü köyü, f.Aksu köyü, g.Kışlak köyü, h.Akarca köyü, i.Boğazköy köyü, j.Çardaklı köyü, k.Palamut köyü).*

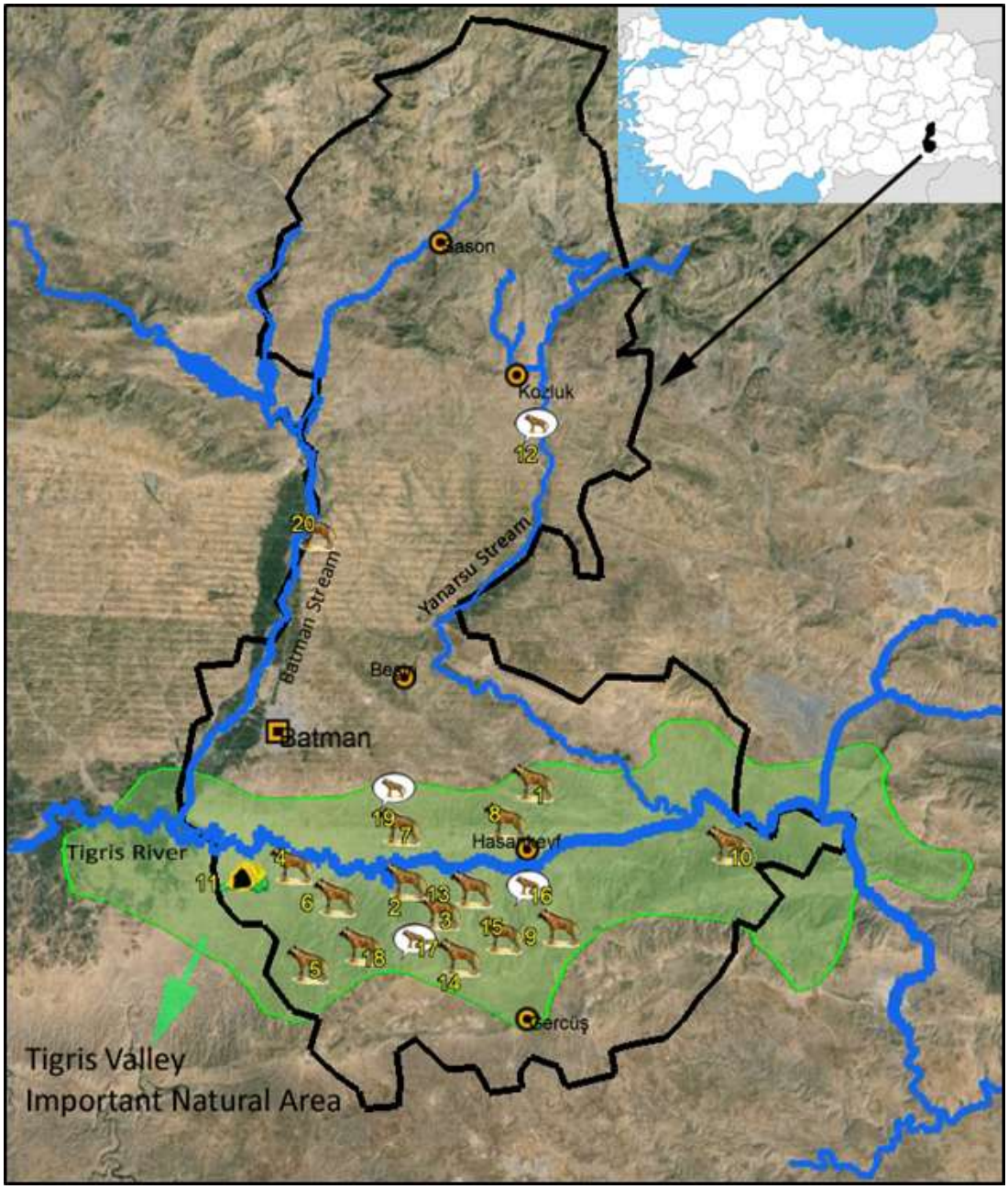


Figure 3. Localities of striped hyenas were detected (1-Kesiktaş village/Beşiri, 2-Kumluca village/Hasankeyf, 3-Mağaralı village/Gercüş, 4-Kantar village/Gercüş, 5-Kışlak village/Gercüş, 6-Akarca village/Gercüş, 7-Demirbilek village/Batman, 8-Raman Mountain/Batman, 9-Akyar village/Gercüş, 10-Palamut village/Hasankeyf, 11-Eymir village/Gercüş 12-Çayönü village/Kozluk, 13-Çardaklı village/Gercüş, 14-Boğazköy village/Gercüş, 15-Aksu village/Gercüş, 16-Karaköy village/Hasankeyf, 17-Geçitköy village/Gercüş, 18-Kömürcü village/Gercüş, 19-Yolveren village/Batman, 20.Bıçakçı village/Batman, camera-trap, nest, interview).

*Şekil 3. Çizgili sırtlanların tespit edildiği lokaliteler (1-Kesiktaş köyü /Beşiri, 2-Kumluca köyü /Hasankeyf, 3-Mağaralı köyü/Gercüş, 4-Kantar köyü /Gercüş, 5-Kışlak köyü /Gercüş, 6-Akarca köyü /Gercüş, 7-Demirbilek köyü /Batman, 8-Raman dağı/Batman, 9-Akyar köyü /Gercüş, 10-Palamut köyü /Hasankeyf, 11-Eymir köyü /Gercüş 12-Çayönü köyü /Kozluk, 13-Çardaklı köyü /Gercüş, 14-Boğazköy köyü /Gercüş, 15-Aksu köyü /Gercüş, 16-Karaköy/Hasankeyf, 17-Geçitköy köyü /Gercüş, 18-Kömürcü köyü /Gercüş, 19-Yolveren köyü /Batman, 20.Bıçakçı köyü /Batman, fotokapan, yuva, anket).*

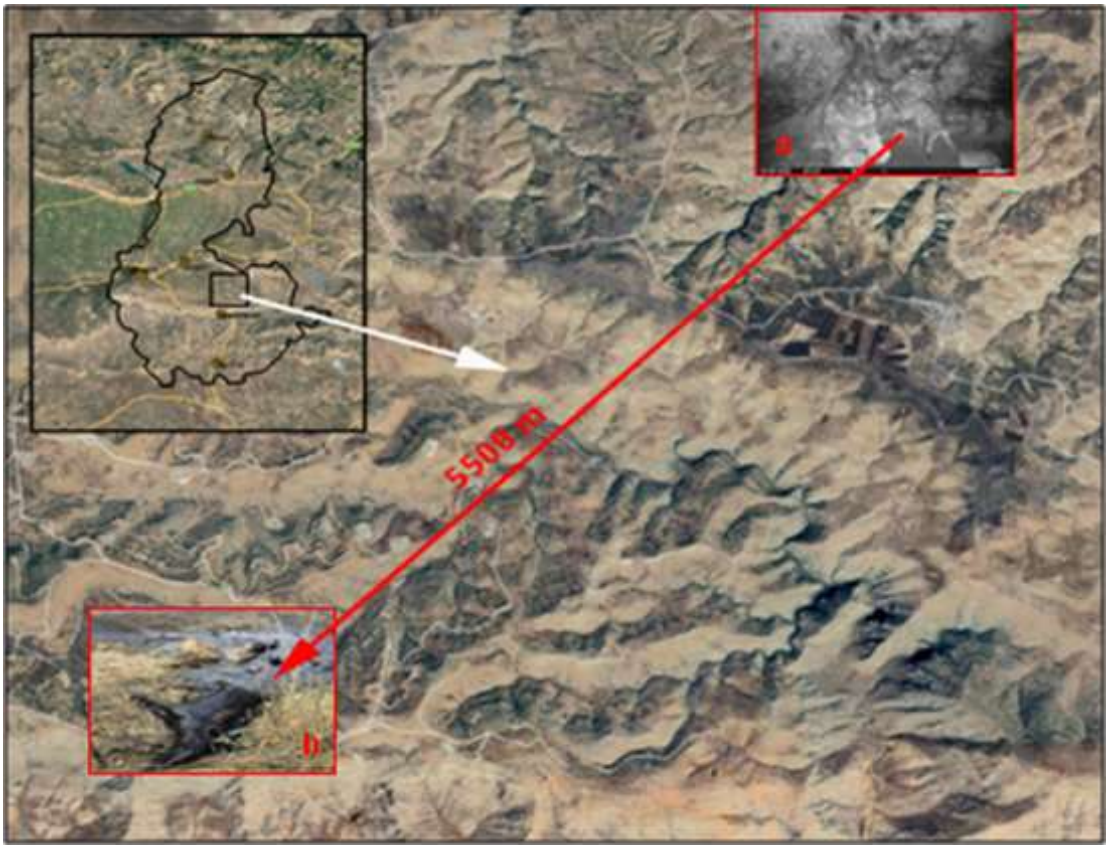


Figure 4. A dead striped hyena in an oil waste 5500 meters away from its nest (a. nest, b. oil waste).
*Şekil 4. Yuvasından 5500 metre uzaklıktaki bir petrol atığında ölmüş çizgili sırtlan (a. yuva, b. petrol atığı).*

## DISCUSSION

The family Hyaenidae is represented by 4 species (*H. hyaena*, *H. brunnea*, *C. crocuta*, *P. cristata*) throughout the world. Only the striped hyena is distributed in Türkiye (Leakey et al., 1999; Yıldırım, 2010; Atay et al., 2017; Kılıç, 2018).

Striped hyenas prefer semi-deserts, steppes, rocky areas, and sparsely forested valleys (Mills & Hoffer, 1998). They have similar natural habitats in Batman Province

Compared to the other three hyena species, fewer studies have been conducted on striped hyenas (Abi-Said & Abi-Said, 2007; Alam et al., 2015; Wagner, 2006). The population of the striped hyena is declining rapidly in the world (Çoğal et al., 2021; Dadashi-Jourdehi et al., 2020; Alam et al., 2015; Kasparek et al., 2004), in addition, it was reported that the population is extinct in many countries (Mills & Hofer, 1998). Among Türkiye's neighbours, the most data on the status of *H. hyaena* comes from Iran. However, recent studies (Özkurt et al., 1998; Kasparek et al., 2004; Akay et al., 2010; Yıldırım, 2010; Kılıç, 2018; Çoğal et al., 2021) have revealed the existence of striped hyena populations in Türkiye. This study showed that striped hyenas are distributed in the southern part of the Batman province (approx. 1000 km$^2$), which is inside the Dicle Valley Important Natural Area (approx. 1355 km$^2$).

Wagner (2006) reported that about half of hyena deaths in Kenya were caused by humans, most deaths in Niger were due to poisoning, and the main cause of population decline in Tanzania was road accidents. Similar to this case, three of the four striped hyenas detected as deceased in this study were road kill.

## CONCLUSION

Anatolia's location at the intersection of three continents and its complex topography and geomorphology offer high habitat and species diversity. The Batman province has rich biodiversity because of its geographical structure, vegetation, and different ecosystems. One of the most important species of this biodiversity is the striped hyena. In this study, as a result of studies carried out in 104 locations in Batman province, striped hyenas were detected in 20 localities by direct and indirect observation methods. This study is the first and most detailed research to determine the local distribution areas of striped hyenas in Türkiye. However, this knowledge of their ecology and behaviour has been limited by the challenges of studying them in their habitats.

The striped hyena, which inhabits caves and burrows in the valleys along the Tigris River, is one of the mammal

species that should be prioritized for protection in the Tigris Valley Important Natural Area, encompassing the districts of Hasankeyf and Gercüş.

The most important factor threatening striped hyenas is roadkill. The cause of death of three of the four striped hyenas found dead was roadkill. The locality of occurred the three roadkill occurred is the Hasankeyf-Gercüş region. In addition, farmers are converting natural habitats into agricultural land, which reduces hyenas' access to food and disrupts the predator-prey balance. Determining the distribution areas of striped hyenas in Türkiye may help manage conservation activities and determine population densities.

According to the IUCN (International Union for Conservation of Nature), the striped hyena is listed as "Near Threatened" (AbiSaid and Dloniak, 2015) globally, while in Türkiye it is listed as "Vulnerable" (Jdeidi et al., 2010). It is also under protection in Türkiye by the Land Hunting Law No. 4915.

The measures to be taken should not be limited to raising awareness, but also the species should be protected by the authorized units and the application of dissuasive punishments.

To give examples of these actions;

a. To prevent road kills, ecological bridges or underpasses can be built in these areas by determining the passing route of the striped hyena. These passages are important not only for the striped hyena but also for other wildlife. In addition, potential harm to humans will be prevented.

b. The education of people in rural areas engaged in agriculture, livestock farming, and hunting will be an important factor in the conservation of the striped hyena.

c. A species action plan should be developed for the striped hyena in Batman province.

d. The disposal of waste to nature that would be harmful to wildlife should be prevented, and the sanctions in this regard should be increased.

e. More comprehensive studies should be carried out to determine the population density of the striped hyena distributed in the Batman province and other regions of Türkiye.

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### Contribution Rate Statement Summary of Researchers

The authors have contributed equally to the article.

### Conflict of Interest

The authors have declared no conflict of interest.

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