



Unusual Winter Activity of the Ottoman Viper (*Montivipera xanthina*) in Türkiye

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Abstract: The seasonal dynamics of reptile species and their responses to fluctuations in environmental temperature play a crucial role in their overall ecological functions. Reptiles are ectothermic organisms, meaning their activity levels are largely influenced by external temperatures. While most reptile species in temperate regions enter a state of hibernation during colder months, some exceptions may occur as a result of environmental changes. In this study, an unusual instance of winter activity was documented in *M. xanthina* (Ottoman viper) in the Karalan-Eskişehir region of Türkiye. A single individual was observed on November 2, 2024, at an ambient temperature of 18.6°C. This observation provides valuable insights into the winter behavior of reptiles, which are generally considered inactive during this time of year. A review of existing literature reveals no prior records of *M. xanthina* exhibiting activity in November or during any other winter month. Therefore, this study presents the first known documentation of winter activity in this species, raising important questions about the potential effects of climate change on reptilian seasonal behavior. Rising temperatures and shifting seasonal patterns may be altering the hibernation strategies of reptiles, leading to extended activity periods. Such changes could have ecological consequences, affecting predator-prey interactions, reproductive cycles, and overall species distributions.

Keywords: Climate change, hibernation, reptiles, temperature, winter behaviors.

Şeritli Engereğin (*Montivipera xanthina*) Türkiye'deki Olağandışı Kış Aktivitesi

Öz: Sürüngen türlerinin mevsimsel dinamikleri ve çevresel sıcaklık dalgalanmalarına verdikleri tepkiler, onların ekolojik işlevleri açısından önemli bir rol oynar. Sürüngenler ektotermik organizmalardır, yani aktiviteleri büyük ölçüde dış sıcaklık tarafından belirlenir. ılıman bölgelerde yaşayan çoğu sürüngen türü soğuk aylarda kış uykusuna girerken, çevresel değişimlere bağlı olarak bazı istisnalar görülebilir. Bu çalışmada, Türkiye'nin Karalan-Eskişehir bölgesinde *M. xanthina* (Osmanlı engereği) türüne ait alışılmadık bir kış aktivitesi belgelendirilmiştir. Tek bir birey, 2 Kasım 2024 tarihinde, 18.6°C ortam sıcaklığında gözlemlenmiştir. Bu gözlem, genellikle bu dönemde hareketsiz olduğu düşünülen sürüngenlerin kış davranışlarına dair önemli bilgiler sunmaktadır. Mevcut literatür incelendiğinde, *M. xanthina*'nın Kasım ayında veya diğer kış aylarında aktivite gösterdiğine dair herhangi bir kayıt bulunmamaktadır. Dolayısıyla, bu çalışma, bu türde bilinen ilk kış aktivitesi kaydını sunarak, iklim değişikliğinin sürüngenlerin mevsimsel davranışları üzerindeki potansiyel etkilerine dair sorular ortaya çıkarmaktadır. Artan sıcaklıklar ve değişen mevsimsel düzenler, sürüngenlerin kış uykusu stratejilerini değiştirerek daha uzun aktivite dönemlerine yol açabilir. Bu tür değişiklikler, av-avcı etkileşimleri, üreme döngüleri ve türlerin genel dağılımı gibi ekolojik sonuçlar doğurabilir.

Anahtar kelimeler: İklim değişikliği, hibernasyon, sürüngenler, sıcaklık, kış davranışı.

INTRODUCTION

Ectothermic animals, such as reptiles, are highly dependent on seasonal temperature fluctuations to carry out their daily functions, as their body temperatures are determined by the surrounding environment (Kurnaz &

Şahin, 2024). Consequently, snakes inhabiting temperate regions and higher latitudes enter hibernation during the winter and become active during warmer periods (Brito, 2003; Zuffi et al., 1999). During active periods, they engage in activities such as reproduction, feeding, biological functions, and escaping predators. However, in

colder seasons, physiological processes are impeded by low temperatures, rendering them incapable of performing these activities (Nordberg & Cobb, 2017). Hibernation enables them to survive the winter with minimal energy expenditure by sheltering underground or in suitable refuges until the next temperate season (Kurnaz & Şahin, 2024).

In recent years, rising temperatures due to global climate change have significantly impacted the behavior and biology of many reptiles (López-Alcaide and Macip-Ríos, 2011; Batum et al., 2025). High temperature fluctuations during winter months cause reptiles to awaken prematurely and exhibit unusual behaviors (Zuffi et al., 1999).

The Ottoman viper (*Montivipera xanthina* [Gray, 1849]) is a robust viper species, reaching lengths exceeding one meter. Its dorsal ground color is gray-brown, adorned with black zigzag-shaped bands. It has vertical pupils and venom that can be dangerous to humans (Baran et al., 2021). This species is found in Western, Central, and Southern Anatolia, as well as on some islands in the Aegean Sea within Greece, at elevations ranging from sea level up to 2000 meters (Yalcın et al., 2014). It prefers open slopes, valley sides, rocky and stony habitats (Gidiş & Başkale, 2020). It is primarily found in lowland areas or low-altitude open hills and can also be observed in agricultural lands (Cattaneo, 2022). *Montivipera xanthina* is listed as Least Concern (LC) on the IUCN Red List.

Numerous taxonomic, systematic, phylogenetic, and distributional studies have been conducted on *M. xanthina*. However, the majority of research has focused on its valuable venom (Nalbantsoy et al., 2013; Yalcın et al., 2014; Jablonski et al., 2015; Stümpel et al. 2016; Afsar et al., 2019). *Montivipera xanthina* has adapted to a narrow thermal range and mesophilic (temperate 20-35°C) environments. During the hot summer period, it exhibits more nocturnal behavior. The species is typically active from March to October (Cattaneo, 2022).

This study presents an observation of the winter activity of *Montivipera xanthina* in this region.

MATERIAL AND METHOD

A specimen of *M. xanthina* was observed near Karalan-Eskişehir by an individual who reported the sighting to us. GPS coordinates and a photograph of the observation were provided (39° 38.977'N, 30° 26.107'E, altitude: 884 m)(Figure 1). At the time of observation, the air temperature was recorded as 18.6°C. Temperature data were obtained from the website www.timeanddate.com (accessed on: 29 January 2025). The specimen was identified through direct observation and was determined to be an adult based on visual assessment (Figure 2).

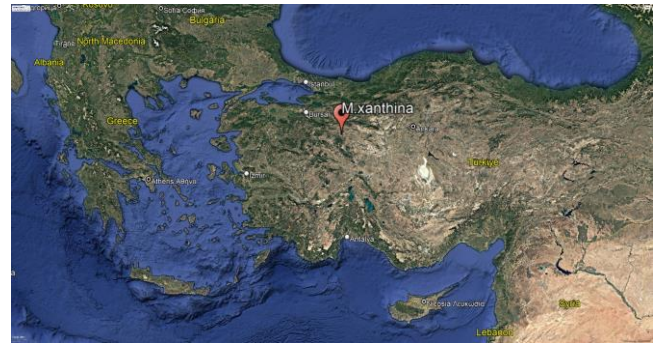


Figure 1. The location of the Ottoman viper (*Montivipera xanthina*) observation on the map (Google Earth).



Figure 2. A visual of the winter activity of the Ottoman viper (*Montivipera xanthina*).

RESULTS

An adult *M.xanthina* was observed on 2 November 2024 at 14:22. The specimen was spotted on a road during a journey. The soil surface temperature at the observation site was measured at 20.3°C, while temperatures at depths of 6 cm and 10 cm were recorded as 19.2°C and 18.9°C, respectively. The humidity at the site was 35%, and the air pressure was recorded as 1019 mbar.

DISCUSSION

Ectothermic organisms, such as *M.xanthina* and other reptiles, are required to undergo hibernation during the winter months due to their limited activity levels. Their metabolism, which depends on ambient temperature, hinders their physiological functions, predation, and ability to evade from predators. This can lead to increased mortality and reduced body mass due to caloric deficiency in viper species (Zuffi et al., 1999; Brito, 2003; Kurnaz & Şahin, 2024).

To date, no studies on the winter activity of *M. xanthina* have been documented in Central Anatolia region. This study presents the first report of this species' activity in November. The observation of an air temperature of 18.6°C at the site is a significant factor contributing to this winter activity. *Montivipera xanthina* particularly favors temperate climates. The highest recorded daytime temperature of 19°C closely aligns with this viper's preferred temperature range (Cattaneo, 2022). Moreover, environmental activity temperatures for many

reptile species have been reported to range between 10°C and 25°C (Mori & Ota, 2002).

Global climate change has adverse effects on reptiles. According to the Turkish State Meteorological Service, the average winter temperature anomaly for 2024 was recorded at +3.3°C. The seasonal average temperature for the region normally 6°C. On the observation date, the average air temperature was 6°C, but just five days later, on 7 November 2024, the daily average temperature dropped to -6°C (www.timeanddate.com). These data suggest that fluctuations in daily air temperatures during winter months may cause reptiles to become active when conditions temperatures are sufficiently warm (Özgül et al., 2022; Kurnaz & Şahin, 2024; Batum et al., 2025).

A study by Ahmadi et al. (2019), projected significant habitat losses for *M. xanthina* by 2050 and 2070 due to climate change. These projections indicate 35% to 50% reduction in suitable habitat and a range contraction to ward higher altitudes. However, habitat fragmentation and anthropogenic barriers are expected to limit these shifts. Additionally, the species' low genetic diversity restricts its adaptive capacity, increasing its vulnerability to climate change. Climate change may also disrupt the reproductive cycles of this species, thereby affecting its demographic rates.

In conclusion, the disruption of hibernation cycles in reptile species poses a significant threat to their survival. These temperature fluctuations, combined with habitat loss may place the species at greater risk. Further field-based investigations are required to validate these findings and to elucidate the ecological mechanisms underlying winter activity in ectothermic reptiles.

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