

A Case of winter activity of the Hermann's Tortoise (*Testudo hermanni* Gmelin, 1789) (Reptilia: Testudinidae) from Bulgaria

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Abstract. The active season of *T. hermanni* in Bulgaria is from March–April to October–November. So far, few cases of winter activity have been registered in the country. Here we report on another such case of an adult *T. hermanni*. The temporary emergence of the specimen from its hibernaculum was probably caused by the combined effect of several factors such as the high ambient temperatures, the orientation of the slope, the altitude, the depth of the hibernaculum used, etc.

Key-words: seasonal activity, emergence, hibernation.

The active season of *T. hermanni* is from February–April to October–November depending on the climatic conditions of the concrete region (Bertolero *et al.* 2011). According to Bertolero *et al.* (2011), the territory of Bulgaria is part of the distribution area of the species that is characterized by a cooler climate. Thus, the active season of the species in Bulgaria is from mid-March or April to October or November (Lazarkevich-Stancheva 1997; Petrov *et al.* 2004; Ivanchev 2007). Juvenile specimens were registered in the last week of February, but the species they belonged to was not identified (Petrov *et al.* 2004). Pulev & Sakelarieva (2011) recorded a recently road-killed specimen on 7 March 1999. Lazarkevich-Stancheva (1997) found several active specimens around 20 March 1991. Ivanchev (2007) studied the hibernation period of *T. hermanni* in Eminska Mountain from 2002 to 2006. The earliest activity registered in his study was on 3 April 2004 and the latest one was on 13 December 2005.

To our knowledge, few cases of winter activity of *T. hermanni* have been published from Bulgaria so far (Ivanchev 2007). Here we report on another case of winter activity of *T. hermanni* from Bulgaria.

An adult female Hermann's Tortoise was recorded in an artificial plantation of Cork Oak (*Quercus suber* Linnaeus, 1753) (Fig. 1A) in the southeastern foothills of Ograzhden Mt. (41.418083, 23.131472, 244 m a.s.l.) north of the village of Parvomay. The observation took place on 2 January 2022 at 2:10 p.m. during a field trip in southern Bulgaria. The specimen was sunbathing next to its hibernaculum on a southeast-facing slope (Fig. 1B). The weather was calm and sunny – the cloud cover was about 10% and the air temperature was 15.8°C. This was the highest temperature recorded for the whole month of January. The weather conditions during the previous day were similar.



Fig. 1. The plantation of *Quercus suber* and the adult female *T. hermanni* recorded in it.

Hibernation can occasionally be interrupted by consecutive days with unusually high temperatures, resulting in a temporary emergence of specimens from their hibernacula (Stubbs 1989; Speybroeck *et al.* 2016; Highfield 2018). According to Petrov *et al.* (2004), active individuals can rarely be seen in Bulgaria during the winter months, although the weather conditions can sometimes be suitable for winter activity. This seems to be true as few records of active specimens of *T. hermanni* have been published from Bulgaria in the winter so far. We suggest that unusually high ambient temperatures could not be the only factor leading to winter activity. Probably, the geographical location of the places of hibernation, the orientation of the slope, the altitude, and the ecological requirements of the species also trigger the winter activity of the reptiles in Bulgaria (Pulev *et al.* 2020). The depth of the hibernaculum and the physical properties of the soil may also be important factors for *T. hermanni*, in particular.

In Bulgaria, the Hermann's Tortoise prefers to dig its winter shelters on south-facing slopes as they receive more solar radiation and are potentially warmer than the other slopes (Undjian 2000; Beshkov & Nanev 2002; Ivanchev 2007; Petrov 2007; Beshkov 2015). The depth of the shelters is usually between 30 and 90 cm (Undjian 2000; Beshkov & Nanev 2002; Petrov 2007), yet Ivanchev (2007) found that the specimens in the area he studied hibernate in 15–20 cm deep shelters. These differences may be due to specifics in mesoclimate in the different parts of the country. For example, in northern Bulgaria, where the climate is cooler, the depth of the winter shelters was found to be about 60 cm (Undjian 2000). In eastern Bulgaria, near the Black Sea, the climate is milder during the winter months, and the depth of the winter shelters was found to be about 20 cm (Ivanchev 2007). Stoyanov *et al.* (2011) studied the changes in the temperature conditions of the soils in the Blagoevgradska Bistritsa River valley for six months. The soil temperature was recorded at three sites situated at different altitudes (490 m, 920 m, and 1480 m a.s.l.). They recorded seasonal changes in the temperature at the three sites at a depth of 60 cm but did not

record any daily temperature variations for the whole period. These results indicate that the individuals that inhabit cooler areas would prefer to prepare their winter shelters deeper in the soil as the temperatures are constant during the winter. This may substantially reduce the risk of freezing. Stoyanov *et al.* (2011), however, registered daily temperature variations at a depth of 5 cm. Consequently, the individuals that prepare shallower winter shelters could more easily sense the changes in the ambient temperatures and are more likely to exhibit winter activity. This might increase the possibility of freezing if the temperatures drop below the critical for the species.

According to Ivanchev (2007), temporary winter activity may be very dangerous for *T. hermanni* when warmer periods are followed by a sudden drop in temperatures. The same author found seven dead Hermann's Tortoises after such a sudden drop in temperatures during the early spring of 2003. Most of the tortoises were found about one meter away from their winter shelters. Yet, they had not been able to find the way back to their shelters, dig new shelters, or just find another shelter. He suggests that the main reason for this was the poor post-hibernation physiological condition of the tortoises.

We found two recently dead adult female Hermann's Tortoises in southwestern Bulgaria on 18 March 2012 (Bachinovo Area, near the city of Blagoevgrad) and around mid-February 2021 (the village of Rakitna). The tortoises had probably died in a way similar to that described by Ivanchev (2007). In both cases, there was a warmer period that was followed by a sharp decrease in temperatures. The tortoise that was found in 2012 had no external signs of injuries or predatory attempts. The tortoise that was found in 2021 also had no external signs of injuries but some of its limbs and a part of its head were missing. These parts of the body were probably eaten by dogs or other animals after the tortoise had died. Ivanchev (2007) also mentioned that some of the dead tortoises found had missing limbs that were probably eaten by animals after the tortoises had died.

Although winter activity may be dangerous for tortoises, it may also be beneficial for them as it is suggested that individuals could feed and drink during this period and therefore restore some weight they have lost (Stubbs & Swinglad 1985). Drinking is probably the preferred activity because weight loss during hibernation is mainly caused by water loss (White & White 1979). Warmer periods during the winter months are rarely prolonged and specimens may not be able to consume and digest a substantial amount of food (Stubbs & Swinglad 1985).

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