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RESEARCH ARTICLE

New Locality Records of *Testudo graeca* (L., 1758) in the Eastern Black Sea Region of Türkiye

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Abstract

Objective: The literature does not clearly specify the locations inhabited by the spur-thighed tortoise (*Testudo graeca*) from the eastern Black Sea coast of Türkiye. This study thus aimes to reveal new locality records for *T. graeca* in Trabzon province.

Materials and Methods: Two adult male specimens were caught from the Darıca and Konaklar neighborhoods in the respective Akçaabat and Ortahisar districts. Some of the morphological characteristics of these specimens have been recorded using a digital caliper. After taking morphometric measurements, the tortoises were returned to their habitat. No anesthetic procedure was performed on the turtles.

Results: Both the Darıca and Konaklar specimens have five vertebral scutes, 11 pairs of marginal scutes, and four pairs of costal scutes on their carapace. In addition, both specimens were seen to have one undivided supracaudal scute and one nuchal scute on their carapace. The Darıca specimen has a straight carapace length (SCL) of 208.19 mm, and plastron length (PL) of 188.08 mm while the Konaklar specimen has an SCL of 216.33 mm and a PL of 196.28 mm.

Conclusion: The study compared its specimens' the pholidosis and morphometric characteristics and color-pattern features with those of specimens reported in the literature. The morphological features of the Darıca and Konaklar specimens are similar to those for the samples of *Testudo graeca ibera* in the literature. The study's findings concluded that the samples of Darıca and Konaklar belong to the *T. g. ibera* subspecies.

Keywords: Pholidosis, spur-thighed tortoise, Trabzon, distribution

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Introduction

The spur-thighed tortoise, or *Testudo graeca* (L., 1758) is listed as vulnerable (VU) on the International Union for Conservation of Nature (IUCN) Red List (Van Dijk *et al.*, 2004). It has two sub-special clades one being the western subspecies clade native to northern Africa and southwestern Europe, including Morocco, Algeria, Libya, Tunisia, and Spain (introduced since historic times on the Balearic Islands of Spain and western Sardinia, Italy; Escoriza *et al.*, 2023). The other is the eastern subspecies clade native to the Balkans and Southwestern Asia including Greece, Bulgaria, North Macedonia, Romania, Kosovo, Türkiye, Serbia, Russia, Georgia, Azerbaijan, Armenia, Iraq, Iran, Syria, Jordan, Lebanon, Israel, and Palestine (Türkozan *et al.*, 2023).

According to morphological traits and molecular data, five subspecies clades are currently recognized among the eastern clade of the species: the Armenian tortoise (Araxes tortoise), or *T. g. armeniaca*, found in Armenia, Azerbaijan, Iran, Russia (Dagestan), and Türkiye; the Zagros tortoise (Buxton's tortoise), or *T. g. buxtoni* found in Iran, Iraq, and Türkiye; the Anatolian tortoise (Greek tortoise/Asia Minor tortoise), or *T. g. ibera* found in Bulgaria, Greece, Georgia, North Macedonia, Kosovo, Romania, Serbia, Türkiye, and Russia (Krasnodar); the Levantine tortoise (Mesopotamian tortoise), or *T. g. terrestris* found in Jordan, Lebanon, Israel, Palestine, Syria, and Türkiye; and the Kerman tortoise (Iranian tortoise), or *T. g. zarudnyi* found in Iran (Türkozan *et al.*, 2023). Similarly, five subspecies are recognized in the western clade of the spur-thighed tortoise: *T. g. cyrenaica* in northeastern Libya; *T. g. graeca* in southwestern Morocco; *T. g. marokkensis* in the northern and central Atlantic plain of Morocco; *T. g. nabeulensis* in Tunisia, extreme northeastern Algeria, northwestern Libya, and introduced in Sardinia; and *T. g. whitei* in northeastern Morocco, western Algeria, peninsular Spain, and introduced in Mallorca and Formentera (previously referred to as *T. g. graeca*; Escoriza *et al.*, 2023).

According to Türkozan *et al.* (2018), four mitochondrial clades (i.e., *armeniaca*, *buxtoni*, *ibera*, and *terrestris*) represent the *T. graeca* species complex in Türkiye. Those authors suggested that the *ibera* mtDNA clade distributes from west to east, while the *terrestris* mtDNA reaches the Taurus range across Türkiye (except for one locality in which *terrestris* and *ibera* are syntopic). The *terrestris* clade is in close contact with the *buxtoni* mtDNA clade along the Anatolian Diagonal (a significant barrier) in the east (Gür, 2016). The *buxtoni* mtDNA clade is distributed in the Zagros Mountain forest-steppe, an ecoregion among the Irano-Anatolian hotspots. The other mtDNA clade, *armeniaca*, is only found in the lowlands of the Araxes Valley in Türkiye. However, syntopic occurrences of *terrestris* and *ibera* (Türkozan *et al.*, 2018), *armeniaca* and *ibera* (Mashkaryan *et al.*, 2013), and *buxtoni* and *armeniaca* (Javanbakht *et al.*, 2017) have combined extensive gene flows among these clades (Mashkaryan *et al.*, 2013; Mikulíček *et al.*, 2013), which suggests the presence of parapatric speciation distributions and hybrid zones.

The species is found in all regions of Türkiye except the eastern Black Sea region (Başoğlu & Baran, 1977; Baran & Atatür, 1998; Baran *et al.*, 2021). Only one record (Lortet, 1887) exist indicating the occurrence of the species in Trabzon province from the eastern Black Sea region. However, Lortet (1887) provided no details about the locality or localities where the species was found.

The present study provides two new locality records for *T. graeca* in the Trabzon province of Türkiye and a comparison of some morphological characteristics of the specimens caught in Trabzon with those of other specimens reported in the literature.

Material and Methods

During a field survey on June 20, 2022, a male specimen of *T. graeca* was observed in the Darıca neighborhood of Akçaabat district in Trabzon province (41°2'342''N, 39°31'234''E, 209 m a.s.l.; Fig. 1). The individual was caught by hand in its natural habitat (Fig. 2).

On June 9, 2023, another male individual of *T. graeca* was found in the Konaklar neighborhood of Ortahisar district in Trabzon province (40°58'736''N, 39°46'430''E, 278 m a.s.l.; Fig. 1). The individual was also caught by hand in its natural habitat (Fig. 2). The two individuals from Darıca and Konaklar were photographed, measured, and released back into their natural habitat.

Body measurements were taken with a digital caliper (accuracy ± 0.01 mm). Morphometric measurements were taken in the same way as Türkozan *et al.* (2005, 2010, 2018) with straight carapace length (SCL) being measured from the outermost projection of the cervical scale to the outermost projection of the posteriors marginals; median carapace width (CW) being measured at the center of the carapace; maximum carapace width (MCW) being measured at the posterior marginals 7-9; carapace height (CH) being the vertical measurement between the most dorsal point of the carapace and the most ventral point of the plastron; and plastron length (PL) being measured from the outermost projection of the gulars to the posterior end of the anals.

The number of scutes on the carapace and plastron were counted. The study also noted the appearance of the

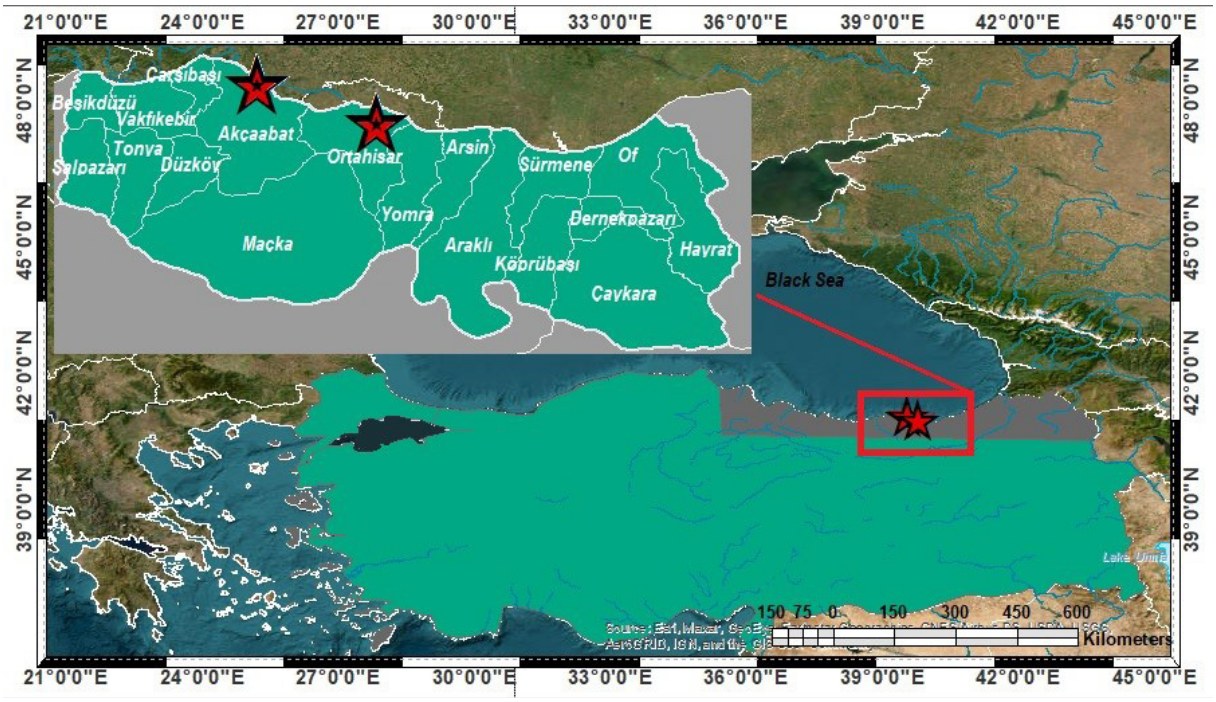

Figure 1. Map of the distribution areas of *Testudo graeca* in Türkiye. Green represents the locations of populations known in the literature. Grey indicates areas where locality records have not been previously reported for *T. graeca*. The red stars show the new localities found in the current study.

Figure 2. (A) Habitat of *Testudo graeca* in the Darıca neighborhood of Akçaabat district in Trabzon province. (B) Habitat of *T. graeca* in the Konaklar neighborhood of Ortahisar district in Trabzon province.

carapace, plastron and plaques, as well as certian features indicated Türkozan *et al.*'s. (2023) study.

Results

The habitat in the Darıca neighborhood consists of a small field with vegetables such as beans, spring onions, lettuce, and surrounding fruit trees. The sympatric reptiles are *Dolichophis caspius* (Gmelin, 1789), *Natrix natrix* (L., 1758), *Darevskia rudis* (Bedriaga, 1886), and *Anguis colchica* (Nordmann, 1840).

The habitat in the Konaklar neighborhood consists of a small field with vegetables such as tomatoes, beans, and hazelnut trees. The sympatric reptiles are *Zamenis longissimus* (Laurenti, 1768), *Darevskia rudis* (Bedriaga, 1886), and *Anguis colchica* (Nordmann, 1840).

Pholidolial characteristics: The specimens from Darıca and Konaklar each have five vertebral scutes, 11 pairs of marginal scutes, and four pairs of costal scutes on their carapace. In addition, one undivided supracaudal scute and one nuchal were seen on the carapaces of each sample. The plastron for both specimens consists of six pairs of scutes.

Morphometric measurements: For the Darıca specimen, the SCL measures 208.19 mm and the PL measures 188.08, while the Konaklar specimen's SCL measure 216.33 mm and its PL 196.28 mm. Comparisons of the morphometric measurements of the Darıca and Konaklar specimens of *T. graeca* to those in the studies of Türkozan *et al.* (2005, 2010) are given in Table 1.

Color-pattern: The Darıca specimen's carapace has a dark color. Dark blue coloration occurs on the head and the costal and vertebral scutes. In addition, this specimen has black spots on the marginal, costal, and vertebral scutes (Fig. 3). The Konaklar specimen's carapace also has a dark color and dark blue coloration on the head (especially on the posterior) and the costal and vertebral scutes. This specimen also has tiny black spots on the marginal, costal, and vertebral scutes (Fig. 3). Both the Darıca and Konaklar specimens's plastron have a light background pattern and include elongated black spots parallel to the longitudinal axis, which form two nearly continuous bands.

Discussion

The presence of *Testudo graeca* on the eastern Black Sea coast of Türkiye was first mentioned by Lortet (1887) without giving any locality name, simply stating it to be present in the province of Trabzon. In addition, Türkozan *et al.* (2023) showed Trabzon province to be in the species' distribution map and explained that this species had either been introduced there or some situation had likely occurred such as an individual trade, translocated specimens or historically relict populations. The present study provides two new locality records (Darıca neighborhood in Akçaabat district and Konaklar neighborhood in Ortahisar district) for *T. graeca* in the Trabzon province of Türkiye. The study has concluded that Trabzon falls within the natural distribution area for this species.

The study compared the pholidolial characteristics and morphometric measurements of the Darıca and Konaklar specimens to those of other Turkish specimens used in the studies of Türkozan *et al.* (2005, 2010, 2023). The morphometric measurements (i.e., SCL, CW, MCW, CH, and PL) of the Darıca and Konaklar specimens have been found to be similar to the *Testudo graeca ibera* measured specimens measured Türkozan *et al*.'s (2005, 2010) studies. In accordance with the geographical distribution of the subspecies of *T. graeca* in Türkiye, this study has also compared the Trabzon specimens with the specimens of the *T. g. ibera* subspecies clades in the literature. The numbers of scutes the Darıca and Konaklar specimens have on their carapace and plastron have been found to be similar to the data shown in Türkozan *et al.* (2023). In addition, Türkozan *et al.* (2023) stated the plastron of *T. g. ibera* to consist of six pairs of scutes and *T. g. ibera* to have wide abdominals, moderately sized femorals and gulars, and relatively narrow humerals. Similar characteristics were seen in the plastrons of the specimens found in Darıca and Konaklar.

This study provides two locality records for the species with only one adult individual beeing seen per locality.

Table 1. Comparison of some of the morphometric measurements of the Darıca and Konaklar specimens of *Testudo graeca* with those for the *Testudo graeca ibera* presented in Türkozan *et al.* (2005, 2010). Lengths are measured in millimeters (mm). For other abbreviations, see the text. Note: Türkozan *et al.*'s (2005) study standardized the CW, MCW, CH, and PL characteristics for maximum carapace length.

	This Study (Darıca specimen)	**This Study (Konaklar Specimen)**	**Türkozan *et al.* (2005)**		**Türkozan *et al.* (2010) (Different Regions of Anatolia)**
Character	**1 ♂**	**1 ♂**	**Mean values of 7 ♂♂ from Agean Region**	**Mean values of 6 ♂♂ from Central Anatolia**	**Mean values of 257 ♂♂**
SCL	208.19	216.33	186.71	211.00	183.5
CW	158.24	166.26	-	-	131.70
MCW	166.18	174.38	-	-	140.30
CH	112.12	120.46	-	-	87.60
PL	188.08	196.28	-	-	160.30

Figure 3. (A) The male *Testudo graeca* specimen found in Darıca. (B) The male *T. graeca* specimen found in Konaklar.

According to the IUCN Red List, the species is in the vulnerable (VU) category and the number of individuals belonging to the species is decreasing. Field observations that will reveal the existence of individuals of this species in other districts of Trabzon and other provinces in the Eastern Black Sea Region should be maintained.

Although the results for the specimens from the Darıca and Konaklar populations are similar to those for the specimens of *T. g. ibera* in the current literature, the number of specimens in this study is very low. Based on the study's morphological findings, these two specimens have been concluded to belong to *T. g. ibera*. However, this conclusion is not based on molecular data.

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References

Baran, İ. & Atatür, M. K. (1998). *Türkiye HerpetoFaunası (Kurbağa ve Sürüngenler)*. Ankara, Türkiye: Türkiye Cumhuriyeti Çevre Bakanlığı.

Baran, İ., Avcı, A., Kumlutaş, Y., Olgun, K., & Ilgaz, Ç. (2021). *Türkiye Amfibi ve Sürüngenleri*. Ankara, Türkiye: Palme Yayınevi.

Başoğlu, M. & Baran, İ. (1977). *Türkiye Sürüngenleri. Kısım I. Kaplumbağa ve Kertenkeleler*. Bornova-İzmir: Ege Üniversitesi Fen Fakültesi Kitaplar Serisi, No. 76.

Escoriza, D., Díaz-Paniagua, C., Andreu, A., & Hassine, J. B. (2023). *Testudo graeca* Linnaeus 1758 (Western Subspecies Clade: *Testudo g. graeca*, *T. g. cyrenaica*, *T. g. marokkensis*, *T. g. nabeulensis*, *T. g. whitei*) – Mediterranean Spur-thighed Tortoise, Moorish Tortoise, Libyan Tortoise, Moroccan Tortoise, Tunisian Tortoise, Souss Valley Tortoise. In A. G. J. Rhodin, J. B. Iverson, P. P. van Dijk, C. B. Stanford, E. V. Goode, K. A. Buhlmann & R. A. Mittermeier (Eds.), *Conservation biology of freshwater turtles and tortoises: A compilation project of the IUCN/SSC tortoise and freshwater turtle specialist group* (pp. 1-18). Chelonian Research Monographs, 5(16), 117.

Gür, H. (2016). The Anatolian diagonal revisited: Testing the ecological basis of a biogeographic boundary. *Zoology in the Middle East*, 62(3), 189-199.

Javanbakht, H., Ihlow, F., Jablonski, D., Široký, P., Fritz, U., Rödder, D., Sharifi, M., & Mikulíček, P. (2017). Genetic diversity and Quaternary range dinamics in Iranian and Transcaucasian tortoises. *Biological Journal of Linnaean Society*, 121(3), 627-640.

Lortet, L. (1887). Observations sur les tortues terrestres et paludines du bassin de la Mediterranee. *Archives du Muséum d'histoire naturelle de Lyon*, 4, 1-26.

Mashkaryan, V., Vamberger, M., Arakelyan, M., Hezaveh, N., Carretero, M. A., Corti, C., Harris, D. J., & Fritz, U. (2013). Gene flow among deeply divergent mtDNA lineages of *Testudo graeca* (Linnaeus, 1758) in Transcaucasia. *Amphibia-Reptilia*, 34(3), 337-351.

Mikulíček, P., Landzik, D., Fritz, U., Schneider, C., & Široký, P. (2013). AFLP analysis shows high incongruence between genetic differentiation and morphology-based taxonomy in a widely distributed tortoise. *Biological Journal of the Linnean Society*, 108, 151-160.

Türkozan, O., Kiremit, F., Lavin, B. R., Bardakcı, F., & Parham, J. F. (2018). Morphological and mitochondrial variation of spur-thighed tortoises, *Testudo graeca*, in Turkey. *Herpetological Journal*, 28, 1-9.

Türkozan, O., Olgun, K., Wilkinson, J., Gillett, L., & Spence, J. (2005). A preliminary survey of *Testudo graeca* Linnaeus 1758 specimens from Central Anatolia, Turkey. *Turkish Journal of Zoology*, 29(3), 255-262.

Türkozan, O., Kiremit, F., Parham, J. F., Olgun, K., & Taşkavak, E. (2010). A quantitative reassessment of morphology-based taxonomic schemes for Turkish tortoises (*Testudo graeca*). *Amphibia-Reptilia*, 31(1), 69-83.

Türkozan, O., Javanbakht, H., Mazanaeva, L., Meiri, S., Korvilev, Y. V., Tzoras, E., Popgeorgiev, G., Shanas, U., & Escoriza, D. (2023). *Testudo graeca* Linnaeus 1758 (Eastern Subspecies Clades: *Testudo g. armeniaca*, *Testudo g. buxtoni*, *Testudo g. ibera*, *Testudo g. terrestris*, *Testudo g. zarudnyi*) – Armenian Tortoise, Zagros Tortoise, Anatolian Tortoise, Levantine Tortoise, Kerman Tortoise. In A. G. J. Rhodin, J. B. Iverson, P. P. van Dijk, C. B. Stanford, E. V. Goode, K. A. Buhlmann & R. A. Mittermeier (Eds.), *Conservation biology of freshwater turtles and tortoises: A compilation project of the IUCN/SSC tortoise and freshwater turtle specialist group* (pp. 1-33). *Chelonian Research Monographs,* 5(17), 120.

Van Dijk, P. P., Corti, C., Mellado, V. P. & Cheylan, M. (2004). *Testudo graeca (*Europe assessment). The IUCN Red List of Threatened Species 2004: e.T21646A9305080. Accessed on 01 November 2023.