

First record of the Yellow-bellied Slider, *Trachemys scripta scripta* (Testudines: Emydidae) in Montenegro

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The Pond Slider *Trachemys scripta* (Thunberg in Schoepff, 1792) is native to the United States and Mexico (Turtle Taxonomy Working Group, 2021). Three subspecies are currently recognised (Turtle Taxonomy Working Group, 2021): the Yellow-bellied Slider or *T. s. scripta* (Thunberg in Schoepff, 1792), the Red-eared Slider or *T. s. elegans* (Wied-Neuwied, 1839) and the Cumberland Slider or *T. s. troostii* (Holbrook, 1836).

During the second half of the twentieth century, large quantities of farm-raised pond sliders were imported into Europe from the United States for the pet trade (Bringsøe, 2006). However, the continue release of these pets into the wild by owners, allowed them to eventually become invasive in Europe (Bringsøe, 2006). Of the three subspecies, the red-eared slider was the most widely imported, consequently the one with the most individual specimens or reproductive population records across Europe (Speybroeck et al., 2016). Although the European Union (EU) imposed a ban on the import of *T. s. elegans* in 1997, other American terrapins including *T. s. scripta* have continued to be imported into Europe for the pet market (Bringsøe, 2006). Also, the sale of these turtles has continued with individuals being produced in EU member states since 2016 when the EU Regulation 1143/2014 on invasive alien species was approved (European Parliament, Council of the European Union, 2014). Up to now, occurrences of noninotypical subspecies are reported in many European countries including the Balkans (e.g., Krofel et al., 2009; Urošević, 2014; Jelić and Jelić, 2015; Tzankov et al., 2015; Koren et al., 2018; Urošević et

al., 2019). In Montenegro, only one published record is available for *T. s. elegans* (Lužnik et al., 2006; also reviewed in Žagar et al., 2013), while for *T. s. scripta* no record existed until this note. Here, I report the first occurrence of the yellow-bellied slider in Montenegro.

On 15 June 2019, during fieldwork along the coastal area of Montenegro, I observed and photographed an adult *T. s. scripta* in a pond at Lovanja locality, municipality of Tivat, Montenegro (42.4020°N, 18.7333°E; 11 m elevation) (Fig. 1). The specimen was seen swimming through floating garbage and basking on the surface (Fig. 2). It was identified as *T. s. scripta* according to its head colouration pattern that is the main diagnostic character used to separate subspecies of the Pond Slider (e.g., Bringsøe, 2006). The pond is located below the hill Sinjarevo and is of artificial origin with scarce aquatic vegetation. It served as the borrow pit for the clay used in the manufacture of bricks during the twentieth century. After brick production stopped, the pit started filling with rain and underground waters. Piles of waste are dumped around the site, so that oozed waters from the landfill flow into the pond (Fig. 3). The site is bordered by the intermittent streams Gradiošnica and Vodolježnica to the west and southeast, respectively. A native Balkan terrapin *Mauremys rivulata* (Valenciennes in Bory de Saint-Vincent, 1833) was observed in the same pond on this occasion.

It is well documented from other European countries where pond sliders are established and invasive, that they can impose threats to native biodiversity through competitive advantage over native terrapins (e.g., Cadi and Joly, 2004; Polo-Cavia et al., 2009; Pearson et al., 2015), an increase in predation pressure on native fauna (Polo-Cavia et al., 2010; Vodrážková et al., 2020; Pérez Salerno and van den Burg, 2021) and disease transmission (Meyer et al., 2015; Demkowska-Kutrzepa et al., 2018). Moreover, successful breeding and nesting has also been recorded in most Mediterranean countries (Martínez-Silvestre et al., 1997; Cadi et al., 2004; Crescente et al., 2014; Standfuss et al., 2016; Koren et al., 2018; Tzoras et al., 2018; Liuzzo et al., 2020) due

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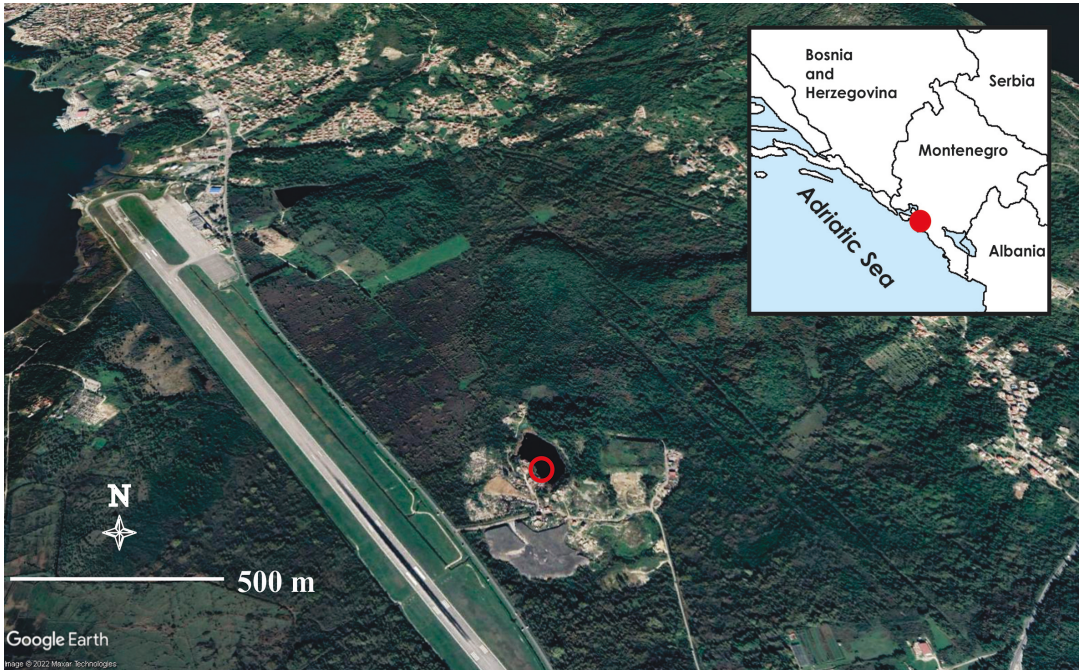


Figure 1. Record of *Trachemys scripta scripta* in a pond at Lovanja locality in Montenegrin coastal area (red circle). The inset map shows the sites's location in a broader area (red dot).

to bioclimatic conditions suitable for reproduction such as warm climate, high solar radiation and precipitations (Ficetola et al., 2009).

Based on the above environmental features, the warm climate and wetlands of the Montenegrin coastal area, where both *T. s. elegans* (Lužnik et al., 2006) and *T. s. scripta* (this study) were found, suggest adequate conditions for their survival and reproductive success, leading to the potential establishment of populations. It is important to mention, that two native terrapins (*Emys orbicularis* and *M. rivulata*) also occur in the same area (e.g., Fritz, 1995; Lužnik et al., 2006; Fritz et al., 2007; Schweiger, 2016; this study), which both are already highly threatened by adverse human impacts on their wetland habitats that exist along the maritime region of Montenegro due to pollution and further habitat loss and degradation through urbanisation (Ljubisavljević and Iković, 2020). Under these conditions of limited resource availability, native terrapins can be outcompeted by invasive *T. scripta* (Pearson et al., 2015). For instance, *T. s. elegans* is able to tolerate habitats with high pollution (Ferronato et al., 2009), and *T. s. scripta* can even increase its population size under similar circumstances (Bringsøe, 2006). Outside

of its native range, *T. scripta* seems most frequently reported in wetlands located in densely populated urban and suburban areas (e.g., Di Santo et al., 2017; Taniguchi et al., 2017; Urošević et al., 2019) where owners usually release them as unwanted pets. Taken all



Figure 2. Adult specimen of *Trachemys scripta scripta* observed among floating garbage in a pond at Lovanja locality, municipality of Tivat, Montenegro. Photo by Katarina Ljubisavljević.



Figure 3. The pond where *Trachemys scripta scripta* was observed, surrounded by piles of waste. Photo by Katarina Ljubisavljević.

together, not only favourable environmental conditions but also urbanisation and population expansion in sub-mediterranean and mediterranean parts of Montenegro, have the potential to increase the likelihood that pond sliders reach and persist in wetlands along the coast and its hinterland.

The Law on Invasive Species was adopted in Montenegro in 2019 (Official Gazette of the Republic of Montenegro no. 18/2019). However, due to delays in preparation and adoption of the List of invasive species, it has still not come into effect. It is one of the important segments in closing Chapter 27 (environment and climate change) in the process of EU integration.

It is obvious that the prompt establishment of an effective legal and regulatory framework for this invasive species is needed. Ongoing pond slider detection is required, and there should be a plan for prevention, control and eradication in an effort to minimise impacts of this invasive species on aquatic ecosystems of Montenegro.

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