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First record of *Mauremys sinensis* (Gray, 1834) and its natural overwintering in Central Europe

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The Chinese Stripe-necked Turtle, *Mauremys sinensis* (Gray, 1834), is widely distributed in subtropical and tropical regions of Taiwan, south-eastern China (including Hainan), eastern Laos and northern and central Vietnam (van Dijk et al., 2014). This species is well adapted to a wide range of climatic conditions, including southern temperate, subtropical and tropical zones, where it inhabits various aquatic habitats, including ponds, lakes, reservoirs, irrigation ditches, and rivers at low elevations (Ernst and Barbour, 1989). Populations have recently suffered substantial declines throughout most of its geographical range (Zhao, 1998; Chen et al., 2000; Hendrie, 2000), possibly as a result of over-exploitation for the Chinese food market, and habitat destruction. Despite the species being listed by the CITES and IUCN (Appendix III – China, Endangered; Buhlmann et al., 2000), it remains a popular pet animal and is still extensively farmed for trade (Shi and Fan, 2002). In China and Taiwan, the recorded number of adult animals for pet trade is nearly 400 thousand; in the Hubei and Guangxi regions, the annual production for trade ranges between 1.5 and 2 million animals (Shi and Fan, 2002). Available data for Taiwan estimated annual production in the largest farms at over 30 thousand hatchlings (Chen et al., 2000). *Mauremys sinensis* is one of the most popular reptiles in the pet trade globally (Kopecký et al., 2013; Masin et al., 2014), despite it rarely being recorded in European nature. Only a few observations are known from Spain and Italy (Moravec, Bataller, pers. comm., 2017).

During a study of the distribution of introduced species of turtles in Slovakia we recorded a basking adult female of *M. sinensis* on 12 August 2015, at around 14:00 hrs local time (Fig. 1A–C). The individual was observed at Chorvatské rameno, an artificial canal (former oxbow lake of the Danube River, Fig. 1D), located in a suburban area of south Bratislava (48.100°N, 17.129°E, 134 m a.s.l.). The site is covered by dense vegetation, primarily *Myriophyllum spicatum*, and water temperature during daytime in August 2016 ranged from 23.5 to 25°C, measured by digital thermometer.

The turtle was identified by the characteristic striped pattern of the head and plastron coloration. The individual was captured on the same day, photographed, measured and a DNA sample taken. The individual had dark dorsal parts of the carapace and head, typical yellow lateral stripes with black legs (Fig. 1A–B). Ventral marginals and the whole plastron were light yellow with dark spots (Fig. 1C). The following body measurements of the individual were taken: weight 1202 g, straight plastron length/width 205/120 mm, straight carapace length/width 205/145 mm, carapace height 90 mm. Standard plastron and carapace measurements and weight of the individual were taken using digital calipers and a Pesola spring balance (0 to 2500 g = 20 g). The tissue sample is deposited in the collections of the Department of Zoology, Comenius University in Bratislava under number 3059 in a 90% ethanol solution. The species was released at the same locality on the same day. On 13 August 2016, the same individual (according to photography and colour pattern of the plastron) was recaptured at the study site. Instead of releasing the turtle for second time, it was handed over to a private turtle keeper in Bratislava to have direct access to the individual.

Introduced populations of two subspecies of *Trachemys scripta* (Thunberg in Schoepff, 1792), *T. s. elegans* (Wied-Neuwied, 1839) and *T. s. scripta*, inhabit the artificial canal Chorvatské rameno, represented by tens of individuals. According to our preliminary results, nominotypic subspecies *T. s. scripta* slightly

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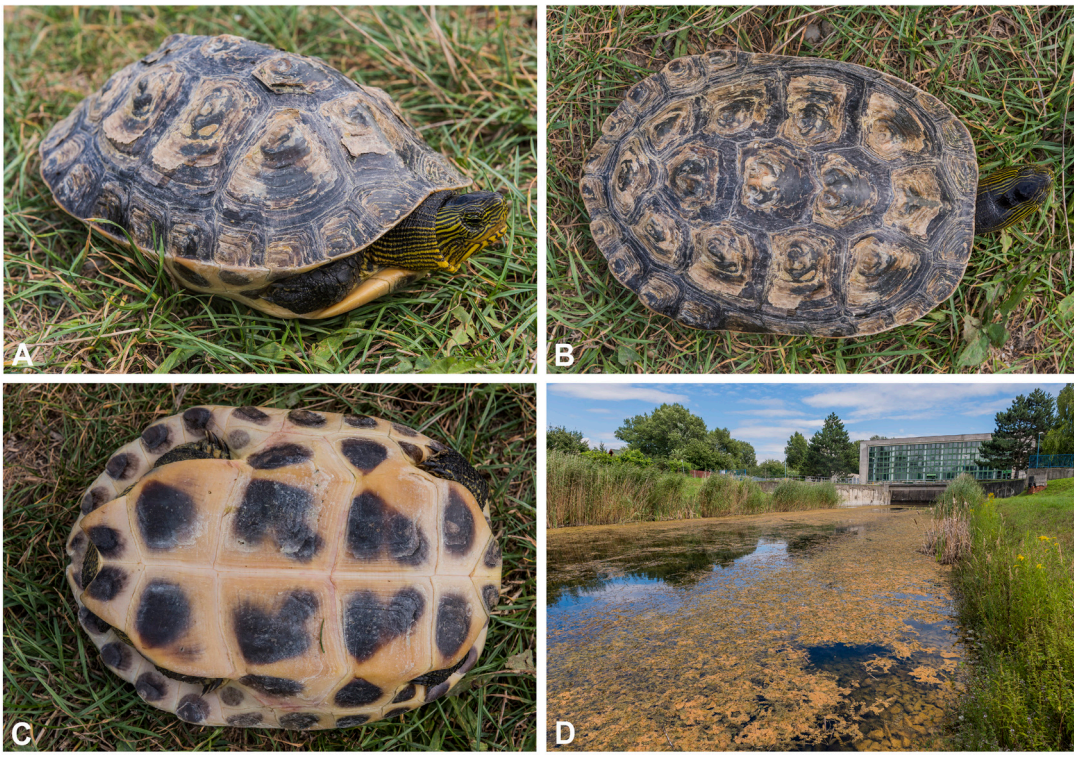

Figure 1. Adult individual of *Mauremys sinensis* from Slovakia from lateral, dorsal and ventral (A–C respectively) and location of its observation (D).

prevails there. Autochthonous turtle species, *Emys orbicularis* (Linnaeus, 1758), was recorded also at the locality (several observations of one female from August and September 2016). The finding of *M. sinensis* represents the first recorded individual in Slovakia and simultaneously its first confirmed overwintering under the climatic conditions of Central Europe. To the best of our knowledge, no similar reports exist from surrounding countries. The turtle is the third known and documented allochthonous species recorded for Slovakia. So far, only the following *T. s. scripta* and *T. s. elegans*, and *Graptemys pseudogeographica* (Gray, 1831) have been reported from Slovakia (Smolinský et al., 2007; Jablonski et al., 2016).

Due to its extensive distribution, *M. sinensis* is tolerant of a range of temperatures. Pan et al. (2003) reported that juveniles like water temperatures around 26°C degrees, air temperatures around 29°C degrees, and basking temperatures around 32°C degrees. These authors also found the upper and lower limits of thermal tolerance in China to be around 41.9°C and 1.8°C respectively (Pan et al., 2003). It is interesting that this individual survived at least one winter with the average temperature in the coldest month (January 2016) being about 3°C degree during the day and -3°C during the night (data of the The Slovak Hydrometeorological Institute).

Import ban of *T. scripta elegans* by European Commission Regulations opens up the possibility for the introduction of other potentially invasive turtles. Although *T. scripta* subspecies are still the ones most often reported in the wild in Europe, there are an increasing number of other non-native turtle species being reported, especially ones from Asia (e.g. Pupins and Pupina, 2011; Brejcha et al., 2014; Jelić and Jelić, 2015). Currently, it is hard to evaluate the impact of these alien species on local biota. However, reproduction of *T. scripta* was confirmed in Europe (Standfuss et al., 2016) and future reproduction of other species is expected (Kopecký et al., 2013). Is it difficult to say if *M. sinensis* will establish local populations in Europe.

According to Bataller (pers. comm., 2017), in Valencia, eastern Spain over 40,000 exotic turtles have been captured since, and from them only four records were of *M. sinensis*. The DAISIE database of alien invasive species in Europe (europe-aliens.com) does not contain any record of *M. sinensis* in continental Europe. Masin et al. (2014) evaluated risk of invasion of frequently traded freshwater turtles based on distribution models. *Mauremys sinensis* was the only species that suitable areas of distribution are situate mostly in tropical regions. For the majority of other studied turtles, suitable areas lie outside the native range, particularly in regions with Mediterranean and temperate climate (Masin et al., 2014). Kopecký et al. (2013) presented a similar result, with the lowest establishment risk rank for this species in Central Europe.

In the wild, food preference in *M. sinensis* depends on sex, where females are known to feed primarily on vegetation, while males readily consume carrion or other animals slow enough to be caught (Chen and Lue, 1998). At the studied locality, the native species *E. orbicularis* is recorded as well (Jablonski et al., 2015; this study), meaning competition could be a potential subject of future discussion, including basking, food etc. (Ficetola and De Bernardi, 2006). Therefore, attention should be given to non-native turtle species and their observations in wildlife recorded. We consider the present observation as unique, probably with no special impact on the local biota.

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