First records of the soft-shelled turtle, *Pelodiscus sinensis* (Wiegmann, 1834), in the Balkans

The Chinese Soft-Shelled Turtle, *Pelodiscus sinensis* (Wiegmann, 1834), a member of the family Trionychidae, is a highly aquatic species. *Pelodiscus sinensis* is native to the Amur and Ussuri river basins in northern China and far east Russian Federation, through Korea, central and south China, Hainan and Taiwan, and to Vietnam in the south, whereas Japan is treated as a non-native area of occurence (e.g., Ota et al. 2004; Fritz et al. 2010). This species is formed by four distinct phylogenetic lineages (Fritz et al. 2010). In Asia these turtles are traditionally farmed in large quantities as a source of food (Cheung & Dudgeon 2006; Haitao et al. 2008). Economically, *Pelodiscus sinensis* is the most important turtle in the world, alongside *Trachemys scripta* (Thunberg in Schoepff, 1792) (Telecky 2001; Haitao et al. 2008). Chinese Soft-Shelled Turtles were systematically introduced, mainly as a food source, into the wild of many Asian countries and the United States including the Hawaii Islands (McKeon & Webb 1982; Ota et al. 2004; Sy et al. 2004; Das & Yaakob 2007; Kraus 2009a). Recently, there have been reports of occasional introductions in Europe, namely from the Iberian Peninsula (Malkmus 2006; Egaña-Callejo 2007; García-Berthou et al. 2007) and Latvia (Pupins & Pupina 2011) as a side-effect of pet trade. There are also records of *P. sinensis* from Central Europe where several observation are known from Vienna, Austria (R. Gemel, pers. comm.) and one adult specimen (CL 325 mm) was caught near Diessen, Bavaria, Germany in 1946 which is assumed to be a survivor from a fish-hatchery where 20 juveniles were kept in 1913 (Gerlach 1960). In this study we present the first records of introduction of *P. sinensis* into the Balkans.

The study area covers Slovenia, Croatia and Bosnia and Herzegovina. Turtles were either caught by netting or just observed without capture. The map was created using ArcGIS 9.3 software (ESRI Redlands, CA: Environmental Systems Research Institute) and WGS84 coordinate system. In total, eight *P. sinensis* specimens were caught or observed in four localities (Fig. 1).

The locality in Bosnia and Herzegovina lies in the karst area of Mostarsko Blato, between the villages Provo and Donji Gradac (43.384346 N / 17.653113 E), municipality of Široki Brijeg, near the River Neretva at Mostar (Fig. 1, A). Two individuals were observed in August 2010. One female was caught (Fig. 1; body mass 482 g, straight carapax length of 146 mm), the larger specimen escaped. The pond (surface approx. 0.8 ha, max. depth 8 m, average depth 4-5 m), where the turtles were observed, developed from a brick clay quarry flooded in the 1980s. The pond was bordered by steep muddy banks with rocky outcrops in the southern shore. The aquatic vegetation consisted of representatives of the genera *Typha*, *Phragmites*, *Juncus* and *Elodea*. The surrounding area was mostly grasses with isolated trees. In winter, the pond surface freezes. There are no native freshwater turtle species reported from Mostarsko Blato.

In Croatia, the locality 'Park Maksimir' is situated at the center of Zagreb city near the Sava River (Fig. 1, B). There are two records of *P. sinensis* from the ponds at this location in the database of the Zagreb Zoo. The first is from summer 2008 when an adult male (200 mm straight carapax length) was caught in the pond 'Treće Jezero' (2 ha, depth 1-4 m, 45.825283 N, 16.018536 E). The animal was in good condition and is still living in the Zagreb Zoo. The second, a fully grown male, was caught in late summer of 2010 in another pond in the park ('Prvo Jezero', 1.5 ha, depth 0.6-3.3 m, 45.821831 N, 16.021044 E). The animal was entrusted to private care. Another two animals were recorded in this park; a male caught in August 2009 ('Treće Jezero'), and a specimen observed also in 2009 ('Četvrto Jezero', 1.1 ha, depth 0.5-1 m, 45.830611 N, 16.027506 E; B. Lauš, Zagreb, Croatian Herpetological Society, pers. obs.). In 2010, *P. sinensis* was reported again from 'Četvrto Jezero' by Lana Malovič, Zagreb, public institution 'Maksimir', probably the same animal as in 2009. Aquatic vegetation of the ponds consisted mostly of plants of the genera *Carex* and

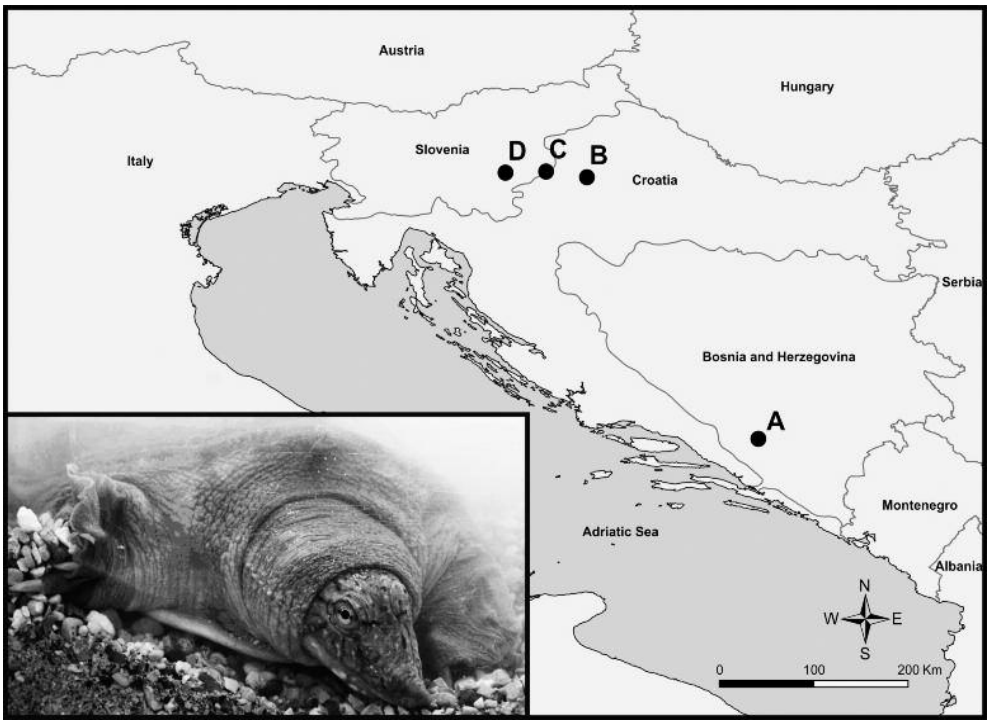

Fig. 1: Map of the distribution records of *Pelodiscus sinensis* (WIEGMANN, 1834) in the north-western Balkans, with marked localities (black spots); A – Mostarsko Blato, Bosnia and Herzegovina; B – Zagreb, Park Maksimir, Croatia; C – Šmarješke Toplice, Slovenia; D – Čatež thermal spa, Slovenia. Inset: Female *P. sinensis* caught at Mostarsko Blato (A).

Juncus. The surroundings represent planted grassland with *Salix* and *Alnus* covering the marshy areas. There is a lowland mixed oak forest throughout the whole park with abundant introduced tree species. Many individuals of introduced *Trachemys scripta* were released there within the last years and native *Emys orbicularis* (LINNAEUS, 1758) lived in the park in the past (CIZELJ pers. obs.), however, the present status of this population is unknown. These ponds freeze during the winter.

In Slovenia, *P. sinensis* was found in two localities. One specimen was observed in a small thermal spring 'Lotus Pond' at the village of Šmarješke Toplice near the Krka River (45.868251 N, 15.241653 E, Fig. 1 C), so called for the pond's thriving population of the Indian Lotus plant (*Nelumbo nucifera*) (SOBAN 1995). The artificial pond is surrounded by small gravel roads and a forest on the eastern side. The second locality, where one individual was observed, is a branch of the Sava River near Čatež with constant inflow from thermal water sources (45.893690 N, 15.598472 E, Fig. 1, D). Water temperature never drops below 15°C in the second locality. The water is covered by the Water Cabbage, *Pistia stratiotes* (ŠAJNA et al. 2007). Populations of *T. scripta* are found in both Slovenian localities and a population of *E. orbicularis* is present at the second (POBOLJŠAJ et al. 2008; KROFELJ et al. 2009).

The number of introductions per unit surface area (propagule pressure, introduction effort) is one of the most important features that decide on the progress and success

of the invasion process (BOMFORD 2009). Another categorizing character of an introduction event is how species enter a new territory. KRAUS (2007) recognized eleven general ways of introductions of amphibians and reptiles. For instance, taxa introduced through nursery trade, as biocontrols or as food were more successful in the invasion process than those introduced by freight transport, pet trade or for aesthetic purposes (KRAUS 2009b). *Pelodiscus sinensis* is offered as a pet for sale in the northern Balkans.

In the study area, introductions of *P. sinensis* are rare. The authors found sporadic releases and it is unknown whether the turtles were imported from Asia or bred in Europe. The presence of single specimens indicates more likely escapes of pet trade animals, intentional releases for aesthetic purposes or released captive specimens.

From a conservation point of view, the situation of native freshwater turtle species in Europe is not very promising. Autochthonous species recede due to habitat changes, deleterious human activities and the presence of allochthonous *T. scripta* (CHELAZI et al. 2007; Anonymous 2012; LIFE – *Trachemys* 2012). Yet another alien species could exacerbate this already complicated situation. Programs for revitalization of native species proved to be difficult to implement (e.g., BARTOLERA & ONO 2009). Also, other water-bound animals that *P. sinensis* may prey upon could become endangered. The diet of *P. sinensis* consists of invertebrates (mainly molluscs) as well as vertebrates (fishes and amphibians) (SATO et al. 2005; DONG et al. 2011). Although tadpoles are able to recognize the presence of native turtle predators, they may not recognize alien turtle species and can therefore more easily be preyed upon by an introduced species (POLO-CAVIA et. al 2010). Moreover, *P. sinensis* can transmit various diseases to autochthonous turtles, other animals (QIAOZHEN et al. 1996; TANGTRONGPIROS 2006; VERNEAU 2011) or people (MAGNINO et al. 2009).

In Slovenia, reproduction of *T. scripta* was reported (VAMBERGER et al. 2012). Since the latitudinal distribution of both alien turtle species (*T. scripta* and *P. sinensis*) is similar in their original ranges, the authors assume that *P. sinensis* might be able to reproduce in some warmer regions of the Balkan Peninsula. Presence of a larger population of turtles at a single location with suitable conditions for survival would increase the chance of reproduction. For the time being, *P. sinensis* must be considered a 'Casual Species' (*sensu* RICHARDSON et al. 2000). To prevent the autochthonous riverine and lacustrine fauna from competition with alien species it is essential to take actions to stop or at least record such introductions.

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