

Basic morphological data of native Czech *Emys orbicularis* revealed by subfossil finds

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Abstract: Holocene Czech *Emys orbicularis* are rare in museum collections because the species disappeared from this region centuries ago. Fifteen reconstructed shells of subfossil Czech specimens of *E. orbicularis* (ranging in age from 3800–3500 BC to 1300 AD) from archaeological sites were used to assess basic morphological data. Our results provide evidence that the extinct Czech turtles fall into the size range of extant Central European *E. orbicularis* populations from the Hungarian Lowland. Maximum male and female straight-line carapacial lengths of the Czech specimens reached at least 160 and 175 mm, respectively.

Key words: *Emys orbicularis*; subfossil specimens; morphology; former distribution; Czech Republic

Introduction

Several recent papers on the phylogeography, systematics and natural history of the European pond turtle *Emys orbicularis* (L., 1758) make this species one of the best-studied chelonians world-wide (for review see Fritz 2003; Fritz & Havaš 2004; Fritz et al. 2007; Sommer et al. 2007). Originally, *E. orbicularis* occurred in a large range extending over a considerable part of the western Palaearctic realm. However, within the last centuries its range became discontinuous (Fritz 1998, 2003). Due to suboptimal environmental conditions, overexploitation and other long-term disturbances by man, *E. orbicularis* has disappeared from many regions of western Central Europe, including the Czech Republic (Široký 2000; Široký et al. 2004; Sommer et al. 2007). Therefore, native Czech specimens of *E. orbicularis* are rare in zoological collections, which is why even basic morphological characteristics are unknown for the extinct Czech *Emys* populations.

However, more than 30 *E. orbicularis* were reported from Holocene archaeological sites located in the two warmest regions of the Czech Republic – the Bohemian Depression and the South Moravian Lowland (Široký et al. 2004). Using these specimens, here we provide data on shell size and proportions and compare the Czech subfossil *E. orbicularis* with the geographically closest extant populations from the Hungarian Lowland.

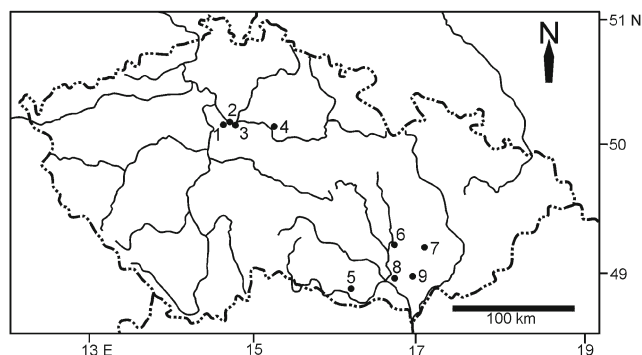


Fig. 1. Archaeological sites yielding *Emys orbicularis* shells used in this study: 1 – Jenštejn, 2 – Ostrov-Zápy, 3 – Čelákovice, 4 – Libice nad Cidlinou, 5 – Borotice, 6 – Horákov, 7 – Brankovice, 8 – Šakvice, 9 – Čejč.

Material and methods

Thirty subfossil *E. orbicularis* originating from archaeological excavations dating from 3800–3500 BC to 1300 AD (Fig. 1) were examined. The 15 best-preserved, reconstructed shells of two males and 13 females were studied in detail (see Appendix). Measurements (straight-line) followed Fritz (1995): carapace length (SCL), maximum carapace width (CW), and plastron length (PL). All dimensions were taken using a caliper to the nearest 0.1 mm and rounded to the nearest 0.5 mm. Many reconstructed shells were incomplete, so that not all measurements could be taken from each specimen. Whenever possible, data of males and females were treated separately to address sexual

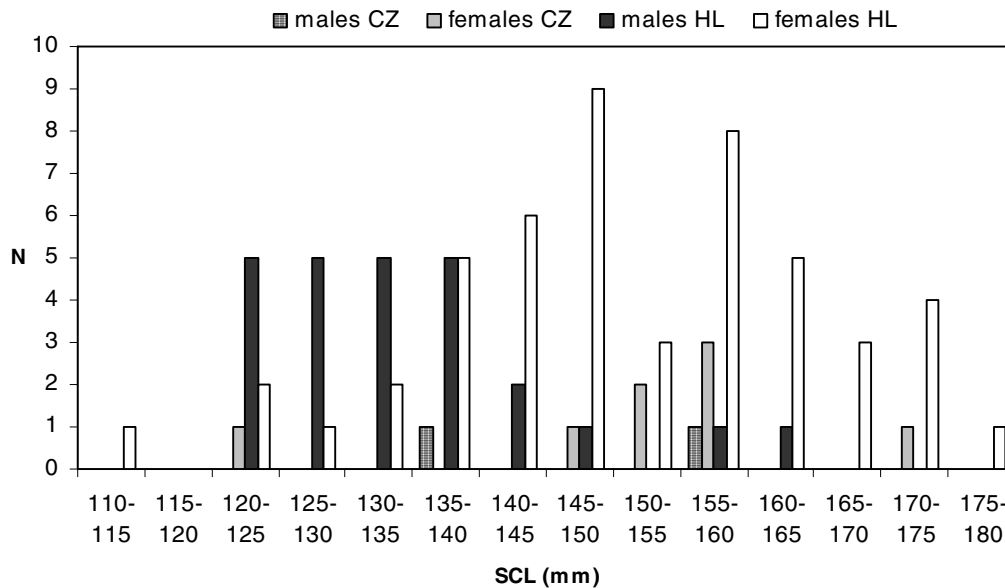


Fig. 2. Frequency distribution of size classes of subfossil *Emys orbicularis* from Czech archaeological sites (CZ) and extant conspecifics from the Hungarian Lowland (HL).

dimorphism. Descriptive statistics and regression lines were calculated using Statistica 6.1 software. For comparison, 75 extant *E. orbicularis* from the Hungarian Lowland (Hungary and adjacent parts of Slovakia, Ukraine and Serbia) were measured (see Appendix). Specimens used in this study are deposited in the Hungarian Natural History Museum Budapest (HNHM); the City Museum of Čelákovice (CMM); the Institute of Archaeology, Academy of Sciences of the Czech Republic Prague (ARUP); the Museum of Zoology Dresden (MTD); the Moravian Museum Brno (MZM); the National Museum Prague (NMP); and the Slovak National Museum Bratislava (SNM). Additionally, measurements of some live specimens in the care of P. Široký (PS) were used.

Results and discussion

We obtained the following basic carapace and plastron measurements of subfossil native Czech *E. orbicularis* specimens (in mm). Adult males: SCL ($n = 2$) 139.0 and 160.0; PL ($n = 1$) 151.0. Adult females (mean \pm SD, range): SCL ($n = 7$) 157.4 ± 8.4 , 149.0–175.0; CW ($n = 6$) 125.8 ± 5.7 , 118.0–134.5; PL ($n = 10$) 151.6 ± 7.0 , 142.0–164.0. Subadult females: SCL ($n = 1$) 122.5; CW ($n = 1$) 102.0; PL ($n = 2$) 117.0 and 122.0. The size class frequency distribution (carapace length) of subfossil Czech specimens and extant turtles from the Hungarian Lowland is shown in Fig. 2; the relation of CW to SCL is compared in Fig. 3.

Although the sample size of subfossil Czech turtles is too small for statistical testing, our data suggest that the Czech individuals reached a smaller maximum size than extant Polish and German *E. orbicularis*. Published average SCL of males and females from Poland are SCL of 163.5 and 181.8 mm, respectively (Mitrus & Zemanek 2004) and of males and females from Germany, SCL 161.2 and 178.2 mm, respectively (Schneeweiß 2003). It seems that the carapace and plastron measurements of the Czech subfossil *E. orbicularis* match rather the extant population from the Hungar-

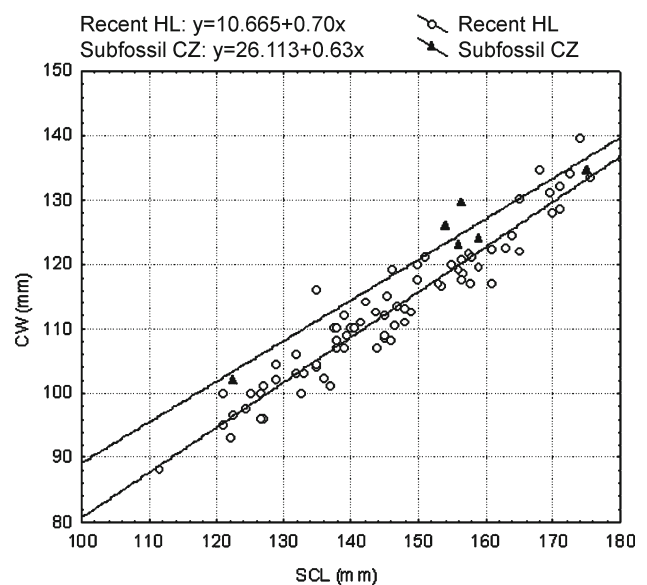


Fig. 3. Comparison of SCL/CW ratios between subfossil Czech specimens (subfossil CZ) and extant turtles from the Hungarian Lowland (extant HL).

ian Lowland (Fig. 2). The relatively wider carapace of Czech specimens (Fig. 3) is probably an artifact due to imperfect shell reconstruction.

Animal bones obtained at archaeological sites offer a useful information source, particularly when data of extant individuals are lacking. Besides information about former distribution, species communities, and range fluctuations (e.g., Adler 1968a, b, 1970; Rhodin & Largy 1984; Rhodin 1992, 1995; Pritchard 1994; Mosseri-Marlio 1998; Albino & Kligmann 2007; Sommer et al. 2007), morphological traits of native, but already extinct, species can be investigated. The size similarity of subfossil Czech *E. orbicularis* and representatives of the extant population from the Hungar-

land supports that *E. orbicularis* immigrated to what is now southern Moravia and Bohemia from the adjacent south-eastern lowlands, as hypothesized, among others, by Farkas et al. (1998), Fritz et al. (2007), and Sommer et al. (2007).

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Appendix 1. Specimens studied

Emys orbicularis from Czech archaeological sites: ARUP J84–714, CMM P 31976, CMM 6/76, MZM Pa 110/34, NMP 6V 72798, NMP 6V 73476, NMP 6V 73477/1–7, NMP 6V 73478, NMP d 1/2008 (paleontology).

Extant *Emys orbicularis* from the Hungarian Lowland: HNHM 61.51.1/1–12, HNHM 62.825.1, HNHM 62.826.1/1–2, HNHM 65.1.1/1–8, HNHM 65.11.1, HNHM 67.32.1/1–2, HNHM 68.76.1, HNHM 68.78.1/1–9, HNHM 68.79.1, HNHM 68.81.1/1–5, HNHM 78.77.1, HNHM 78.102.1, HNHM 2002.368.1, MTD 5884, MTD 14356–14358, MTD 33708, MTD 35948, MTD 40211, NMP 6V 70654/1, NMP 6V 70654/3, PS EO/1–6, SNM-PM-ST 632/1–13, SNM-PM-ST 372, SNM-PM-ST 73.