

First genetic investigations into the occurrence of *Emys orbicularis* (LINNAEUS, 1758) in Carinthia, Austria

Answers to the question of whether the European Pond Turtle *Emys orbicularis* (LINNAEUS, 1758), is an autochthonous or allochthonous element of the Carinthian fauna are largely based on speculations (CABELA et al. 1992; GRILLITSCH & CABELA 2001). Though numerous finds leave no doubt as to the species' occurrence, they do not tell us anything about their provenance. According to the latest findings through genetic analyses, however, there exist different haplotypes throughout Europe, each of which can be associated clearly with certain geographic regions (FRITZ et al. 2007, 2009). As concerns Austria, genetic analyses of *E. orbicularis* were conducted in the Danube River floodplains of the Donau-Auen National Park (SCHINDLER 2005) and in the province of Vorarlberg (KLEEWEIN & WÖSS 2013). Since 2011, the author has taken samples from specimens found in the wild in Carinthia and given to the Reptilienzoo Happ (Klagenfurt), using a cotton bud to get a swab of the mucus layer of the mouth. The samples were taken immediately after the animals were handed over to the zoo. The mtDNA was examined by d-loop-analysis according to POSCHADEL & MÖLLER (2004), using the mitochondrial cytochrome *b* gene as a marker (FRITZ et al. 2004, 2007, 2009).

The above analysis of six individuals revealed the presence of four different haplotypes in Carinthia: Ia, IIa, IIc and IVd (naming according to FRITZ et al. 2004, 2007) (Table 1).

Thanks to the discovery at Lake Keutschacher See (Carinthian Basin, 46°35'10" N / 14°09'40" E, 506 m a.s.l.) of subfossil shell remains of *E. orbicularis* from the Epi-Lengyel complex (5,000 to 4,800 B.P.) (PUCHER 2001), this species can be considered to have once been autochthonous in Carinthia. The oldest written Carinthian record from historical times originates from 1640 when *E. orbicularis* was mentioned in a price list of the fish market held in the municipality of Klagenfurt (GASPER 2007). As the Carinthian animals alone would probably not have sufficed to cover the demand for this species as a Lenten food, an initial introgression of foreign genetic material into autochthonous Carinthian *Emys* populations can be assumed for the Middle Ages. The same situation was described from central and southern Germany, where imports of *E. orbicularis* occurred from Prussia and south European countries (FRITZ & LAUFER 2007).

The literature of the 20th century contains various references as to the species' occurrence in Carinthia. PUSCHNIG (1934, 1942) listed *E. orbicularis* as extinct in Carinthia, implying its former autochthonous occurrence and mentioned recent recordings at the time. Considerations were published in the following years as to whether or not recent findings of *E. orbicularis* in Carinthia referred to autochthonous specimens and the issues of release were discussed (FINDENEGG 1951; SOCHUREK 1957; SAMPL 1976; CABELA et al. 1992; GRILLITSCH & CABELA 2001).

The present genetic analysis in Carinthia now provides a first clear image at a mitochondrial level. Haplotype IVd is autochthonous to the region of southern Apulia

Table 1: Haplotypes and collecting data of six individuals of *Emys orbicularis* (LINNAEUS, 1785) from Carinthia.

Haplotype	Collecting date	Sex	Water system	Coordinates (WGS84 datum)	Altitude (m a.s.l.)
Ia	05/09/2014	male	Gurk River	46°41'01"N / 14°29'57"E	485
IIa	13/06/2014	female	Drava River, Rosental Valley	46°32'28"N / 14°15'13"E	429
IIa	14/09/2013	male	Lavant River, near the municipality of St. Paul	46°43'34"N / 14°51'17"E	384
IIa	30/04/2014	male	Wörthersee, Municipality of Schiefeling am See	46°36'10"N / 14°05'30"E	568
IIc	01/06/2011	female	Drava River, Rosental Valley	46°32'39"N / 14°13'13"E	434
IVd	19/06/2011	female	Gurk River	46°51'50"N / 14°26'10"E	577

and Montenegro, and is therefore certainly allochthonous in Carinthia. The haplotype Ia individual can also safely be considered allochthonous, because this haplotype is found from Poland to Kazakhstan and Turkey (FRITZ et al. 2007). Haplotype IIc is only known from Lake Balaton and the slightly more north-eastern Lake Velence, both in Hungary (FRITZ et al. 2007). The alien Carinthian specimens may well have been taken back home by Carinthian visitors to those regions. However, releases are not only to be ascribed to “souvenirs” from tourist destinations. Escaped and even consciously released aquarium specimens of allochthonous turtle species of the genera *Trachemys*, *Pseudemys* and *Graptemys* have been recorded in Carinthia for many years (KLEWEIN 2007, 2014). Thus, the presence of autochthonous relict populations of the above *E. orbicularis* haplotypes in Carinthia is highly unlikely.

Haplotype IIa is widespread throughout Europe and therefore may well have previously been autochthonous in Carinthia. However, a natural recent occurrence of haplotype IIa in Carinthia as well as migration into Carinthia from Slovenia via the Drava River are unlikely, due to the fact that there was no such haplotype found in neighboring Slovenia or along the Drava River, which forms a link between these two countries (Uwe FRITZ, pers. comm.).

In conclusion, the current sporadic occurrence of *E. orbicularis* in Carinthia is made up of individuals of several mitochondrial haplotype lineages. Due to the small number of discovered individuals, the existence of viable populations can be ruled out. The IUCN (2014) lists *E. orbicularis* as LR / NT (Lower Risk / Near Threatened). As no autochthonous haplotype can currently be determined for Carinthia, protective measures cannot be put into action. However, FRITZ (2000) generally advocates rethinking of protective measures for *E. orbicularis* due to the profound fragmentation of the species into often highly localized subspecies.

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