

Natural reproduction of *Trachemys scripta troostii* (HOLBROOK, 1836)
x *Trachemys scripta scripta*
(SCHOEPFF, 1792) in Austria

Reproduction in the wild of allochthonous turtles, particularly Red-eared Sliders *Trachemys scripta elegans* (WIED-NEUWIED, 1839), was recorded in a number of European countries (MARTÍNEZ-SILVESTRE et al. 1997; FICETOLA et al. 2002; CADI et al. 2004; WÜTHRICH 2004; GIRONDOT et al. 2012; VAMBERGER et al. 2012), including Austria (GUTLEB & HAPP 2002; GEMEL et al. 2005). Due to the ban of *T. scripta elegans* imports into the European Union (imposed on December 22, 1997), pet stores increasingly began to import other turtle species, some of them more resistant to the cold than the Red-eared Slider.

One such turtle, the Cumberland Slider *Trachemys scripta troostii* (HOLBROOK, 1836), an invasive species in European wetlands (BUGTER et al. 2011), can survive in the wild for a number of years, even in north European countries, e.g., Lithuania (PUPINS & PUPINA 2011). It is a New World species, whose natural range comprises the upper reaches of the Cumberland and Tennessee Rivers, from south-eastern Virginia and Kentucky to north-eastern Alabama (ERNST 1990). There were no records of successful reproduction in nature of this subspecies in Europe.

The author of the present note was informed by Helga HAPP (Reptile Zoo in Klagenfurt, Carinthia, Austria) that six turtles had hatched near a garden pond on October 7, 2012. The site was inspected and the hatchlings were measured the following day. A calliper was used to take shell measurements and a kitchen scale to weigh the hatchlings. The hatching site was situated next to a garden pond in the village of Tallach in southern Carinthia, Austria (14° 04' 13" E / 46° 32' 20" N; 516 m a.s.l.). Temperature and rainfall data from two meters above ground were obtained from ZAMG (Zentralanstalt für Meteorologie und Geodynamik) at Klagenfurt and refer to the meteorological station at the village of Ferlach (14° 18' 51" E / 46° 31' 52" N; 459 m a.s.l.), which was closest to the hatching

site. As soil temperatures measured at 10 cm below the surface (i. e., the position of the egg chamber) were not available, these values were taken from the meteorological station at Klagenfurt Airport (14° 19' 04" E / 46° 38' 54" N; 452 m a.s.l.). According to ZAMG, these two sites differ only slightly in their characteristics.

The female was an untypical specimen of *Trachemys scripta scripta* (SCHOEPFF, 1792), which showed certain features of other subspecies and thus may have originated from an intergradation zone in the wild, or represent a hybrid from a breeding farm. The male was clearly classified as *T. scripta troostii*.

According to the garden owners, both turtles were kept in a pond over the summer months since 2003. Oviposition, always at the same sandy and sun-exposed location, was recorded since 2007. Confirmation that the deposited eggs were indeed fertilized was achieved in 2008 when the eggs were incubated until they hatched. Three clutches comprising six eggs each were laid in 2011. An examination of the first clutch revealed dead hatchlings partially emerged from the uppermost eggs. In 2012, oviposition was observed on June 10 and again on July 10. No information is available on the depth of oviposition. The first clutch was examined on October 10, 2012 at 3:00 pm. Six hatchlings were found alive near the surface and were placed in an aquarium for further care. Each hatchling's yolk sac was already largely absorbed, the egg tooth still present. The shells and epidermal keratinous scutes did not show any morphological anomalies. Each plastral scute was covered with dark spots. All six hatchlings had a vertical connection between the postorbital stripe and the orbito-cervical stripe behind the eye. The carapace lengths ranged from 2.83 to 2.96 cm, the carapace breadths from 1.99 to 2.29 cm and the shell height from 1.43 to 1.54 cm. Body mass ranged from 5 to 6 g (Table 1).

Sunshine duration at the hatching site between June and September was six to eight hours per day, and limited to the afternoons. The incubation period of the clutch lasted 119 days. Ambient air temperature ranged from 2.5 °C (September 21, 2012) to 35.8 °C (July 1, 2012) over the entire incu-

Table 1: Morphometric data of the six *Trachemys scripta* (SCHOEPFF, 1792) hatched in a garden at the village of Tallach (Carinthia, Austria) in 2012. Shell measurements in centimeters, body mass in grams. HN - Hatching Number, CL - Carapace Length, CB - Carapace Breadth, PL - Plastron Length, PB - Plastron Breadth, SH - Shell Height, BM - Body Mass, Mean - Arithmetic Mean, SD - Standard Deviation.

HN	1	2	3	4	5	6	Mean	SD
CL	2.94	2.83	2.96	2.83	2.93	2.88	2.895	0.057
CB	2.73	2.62	2.86	2.98	2.72	2.72	2.772	0.128
PL	2.78	2.68	2.79	2.76	2.82	2.63	2.743	0.073
PB	2.07	1.99	2.16	2.29	2.12	2.13	2.127	0.099
SH	1.44	1.44	1.5	1.54	1.43	1.49	1.473	0.044
BM	5	5	6	6	6	5	5.5	0.548

bation period. On July 1, 2012, for example, the fluctuation in ambient air temperature amounted to 18.3 °C. The fluctuation of soil temperature, on the other hand, was only 8 °C on the same day. Soil temperatures ranged from a minimum of 12.6 °C (September 21, 2012) to a maximum of 31.4 °C (July 9, 2012). Overall average soil temperature in a depth of 10 cm was 21.4 °C. Daily average soil temperatures exceeded 25 °C on only 14 days, and only by 1 or 2 °C. Rainfall between June 10 and October 7, 2012, around Ferlach amounted to 581.5 mm (June 85.5 mm, $n = 21$ d; July 219.1 mm, $n = 31$ d; August 104 mm, $n = 31$ d; September 189.5 mm, $n = 30$ d; October 1 mm, $n = 7$ d) (Fig. 1). Average monthly rainfall between July and September, measured from the moment of oviposition until hatching, was 149.53 mm.

The clutch deposited on July 10 did not hatch. The clutch laid on June 10 was incu-

bated *in situ* solely by the ambient temperature in the dark of the egg chamber. The incubation period was comparatively long, in accordance with the natural fluctuations and due to the low average soil temperatures (see below). In their natural habitat, young *T. scripta* hatch after 60 to 88 days (EWERT 1979). Thus, an incubation period of 119 days exceeds the natural duration by 35 to 98 %. According to ERNST & LOVICH (2009) an incubation period of 119 days would have resulted from an average clutch temperature of less than 25 °C. Due to the low overall average soil temperature of 21.4 °C, hatchlings were male.

Eggs of *T. scripta* that developed in dry incubation substrate, produced smaller and lighter hatchlings than those in moist substrates (CONGDON & GIBBONS 1990; TUCKER & PAUKSTIS 1999). This observation was confirmed in the present case, where the hatchlings weighed only 5 to 6 g.

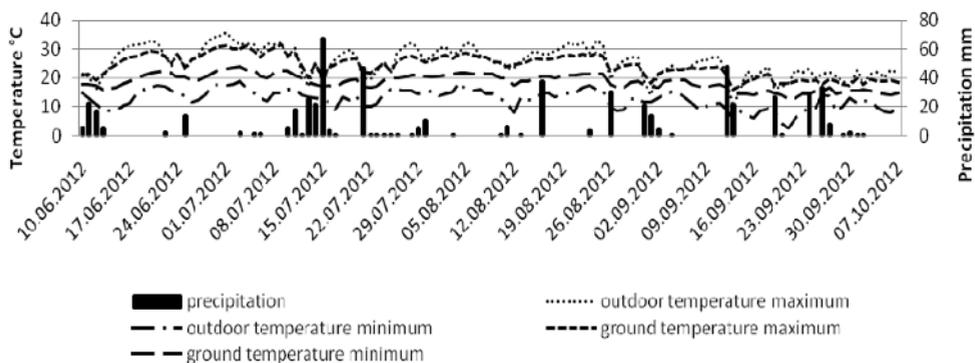


Fig. 1: Ambient air temperature and rainfall data from the meteorological station at the village of Ferlach. Soil temperature refers to the meteorological station at Klagenfurt Airport. Daily temperature maxima and minima were measured at 2 m above ground, soil temperature maxima and minima at a depth of 10 cm below ground. Rainfall data is given for June through October. Temperature values are on the left axis, rainfall values on the right.

In the wild of North America, hatchlings of *T. scripta* weighed between 4.4 and 10.3 g ($n = 151$) (TUCKER 2000). With a mean carapace length of 28.95 mm, the hatchlings' body size was also clearly at the lower end of the species' range. The carapace length of hatchlings of wild populations in Illinois, for example, were 2.54 to 4.0 cm (TUCKER 2000).

Survival rate of hatchlings that developed in moist substrate was higher than of hatchlings from dry soil (TUCKER & PAUKSTIS 1999). The hatchlings in Tallach looked somewhat listless, which could be an indication of low incubation substrate moisture, lessening the animals' fitness.

Trachemys scripta troostii is occasionally available in Austrian pet stores. Based on the above observations of reduced fitness and imbalanced sex ratio of the hatchlings under the climate conditions of Austria, release of this species into the wild of Middle Europe may not necessarily result in viable populations including their potentially negative consequences to the native fauna. Over the past decade, sliders became increasingly uncommon in Austrian pet trade. Other species took their place, so that the spectrum of alien turtles currently found in the wild is more diverse than in the past. In addition, records of such turtles are now far more precisely and consequently reported. Since negative influence of allochthonous sliders on the ecosystem is often discussed, it should also be stressed that the release of allochthonous species is prohibited by a number of regulations (HASSL et al. 2011).

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