

Notes on some biometrical data on hatchlings of *Lacerta agilis* (L.) (Squamata: Lacertidae) in Western Bulgaria

The Sand lizard *Lacerta agilis* Linnaeus, 1758 is one of the three lizards from the genus *Lacerta* L. in Bulgaria. The subspecies *L. a. chersonensis* Andrzejowski, 1832 is sporadically distributed in Western Bulgaria with single localities on the Northern Black Sea Coast and Strandzha Mts. (Stojanov et al. 2011, Tzankov et al. 2014).

There are many studies from different parts of the range of the species, dealing with its reproductive biology and fecundity (Jensen 1982, Olsson & Shine 1997a,b, in den Bosch & Bout 1998, Amat et al. 2000, Roitberg et al. 2015), but to our knowledge published data from the Balkans are lacking. Furthermore, there are no papers concerning the life cycle of the species in Bulgaria, just few on some ecological aspects and microhabitat preferences (Grozdanov et al. 2014; Popova et al. 2020).

Up to date, there are only few studies and observations on the reproduction of different lizard species in Bulgaria. Mollov (2011) and Undjian (2000) present data on the egg size in *Mediodactylus kotschyi* (Steindachner, 1870), while Garbov (1990) and Vergilov et al. (2018) provide information on the reproduction and eggs of *Ablepharus kitaibelii* (Bibron & Bory de Saint-Vincent, 1833). The only data for Bulgaria on hatchling size of a lizard species are those of Vergilov & Natchev (2018) again, for *A. kitaibelii*. No data on the hatchling size or the life cycle of any other species from the country have been published so far.

In the current study, data on the snout-vent length, tail length and weight of newly hatched individuals of *L. agilis* are presented.

In August 2014, seven eggs of *L. agilis chersonensis* were found in the garden of a house in Benkovski district, Sofia, Bulgaria. The eggs were carefully removed from the garden (due to agricultural activities) and placed in soil in a plastic box with vol. app. 500 ml. The

eggs were incubated at room temperature (24-26°C) and the soil was moistened periodically (almost every day). Because of the unknown date/period of egg laying, we could not determine the exact incubation period, but after 10-14 days, all eggs had hatched successfully (Fig. 1A). After hatching, each individual was photographed and measured on the next day. The snout-vent length (SVL) and the tail length (TL) were taken with a plastic ruler, and the weight (W) was taken with an electronic weighting scale MXX-123 (Denver Instrument, NY, USA) with accuracy of 0.01 g. After the measurements, all lizards were released in the nearest large meadow in the same district.

The number of eggs we found (seven) corresponds to the species' clutch size mentioned in the literature - between 2 and 19 eggs (see Roitberg et al. 2015).

All seven measured juveniles (Tab. 1, Fig. 1B) were with SVL of 30-31 mm and W of 0.41-0.56 g (Tab. 1).

The mean mass of the hatchlings was 0.49 g and the mean SVL was 30.26 mm (see Tab. 1). Tzankov (2007) and Stojanov et al. (2011) mentioned that the hatchlings of *L. agilis* for Bulgaria have a SVL of 30 mm and 27.2 mm. In both sources, the origin of that information is not stated, but most likely it refers to what is published for the species in other countries. The mass and SVL of the hatchlings for other



Figure 1. The juveniles of *L. agilis* in the present study. A - hatching of a juvenile, B - measuring a juvenile's weight, C - the juveniles before releasing them back into the wild.

Table 1. Measurements of the snout-vent length (SVL), weight (W) and tail length (TL), with mean and min-max values of the hatchlings of *L. agilis*.

Juvenile	SVL (mm)	TL (mm)	Weight (g)
1	30	35.5	0.47
2	30	36.6	0.48
3	30.3	37	0.54
4	30.5	38.5	0.56
5	31	36	0.51
6	30	36.3	0.41
7	30	37.5	0.44
Mean	30.26	36.77	0.49
Min-Max	30.00-31.00	35.50-38.50	0.41-0.56

countries vary from mean 0.59 g (from wild females), to 0.61 g (from laboratory-raised animals) for Swedish populations of *L. a. agilis* L. (Olsson & Shine 1997a). Again, for *L. a. agilis* in den Bosch & Bout (1998) give the following mean values for the SVL and mass of the hatchlings: 24.6 mm and 0.70 g. For a Chinese population of the species, Li et al. (2011) give the following mean values of SVL and mass depending on the different temperature of incubation – between 33.3 mm and 34.5 mm for SVL and between 0.76 g and 0.87 g for themass. The mass of the hatchlings of our study is closer to that of juveniles from wild females (Olsson & Shine 1997a), probably because of the fact that most of the time the eggs in our study were incubated in natural conditions. To our knowledge, our data are the first for any lacertid species, where eggs were found in the wild, incubated, and the hatchlings were subsequently measured. Some caution is needed, of course, when comparing the results of our study to those in other publications, because of the differences in incubation – eggs found in the wild (i.e., most of the time incubated in natural conditions) (this study) vs. laboratory incubation conditions (see Ollson 1997b, in den Bosch & Bout 1998, Roitberg et al. 2015); and also when comparing different subspecies, inhabiting different ecological conditions and habitats.

The currently presented data on selected biometrical parameters are the first for *L. agilis* for the country and the region. More studies on the reproductive biology of the species are needed in order to better evaluate and compare in greater detail data from Bulgaria to populations in other countries across its range.

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