

Mass migration of *Pelobates syriacus* (BOETTGER, 1889) metamorphs

The spadefoot toads of the west Palearctic genus *Pelobates* are highly specialized nocturnal species that utilize a narrow ecological niche: they are obligatory burrowing species, and the landscape features strongly influence the spreading and abundance of their populations (NÖLLERT 1984; HELS & NACHMAN 2002; TARKHNISHVILI et al. 2009). Spadefoot toads occur in sandy areas, heath lands and deciduous woodlands with loamy soils. The spawning habitats include a variety of both permanent and temporary water bodies. The larval stage is of comparatively long duration (up to five months) and can be prolonged considerably (more than a year; FUHN 1960), with the larvae attaining much larger size than those of other European anurans (NÖLLERT 1984). The Eastern Spadefoot Toad *Pelobates syriacus* (BOETTGER, 1889), is an explosive breeder with an annual reproduction period lasting less than a week (COGĂLNICEANU et al. 2013b).

A natural sandy levee in the Grindul Lupilor Scientific Reserve, located in the southern part of the Danube Delta Biosphere Reserve, Romania (44°37'14.47"N, 28°48'26.39"E, -2 m a.s.l.), supports a large population of *P. syriacus* that was intensively studied during the last seven years (SZÉKELY et al. 2010; COGĂLNICEANU et al. 2013a; COGĂLNICEANU et al. 2014). The levee separates two large water bodies and is crossed lengthwise by a 6 m wide dirt road. The road has a low-intensity traffic load (on average, less than 5 vehicles/hour). The terrestrial habitats are partly salinized sandy soils, covered with steppe vegetation, surrounded by shallow wetlands covered with reed (*Phragmites australis*) and rushes (*Typha* sp.).

The authors observed a mass migration of freshly metamorphosed *P. syriacus* (Fig. 1), numbering in the thousands, during three consecutive nights (18-21 June) in 2013. The majority had completed metamorphosis, but some juveniles still showed a short tail.

The juveniles varied largely in body size: snout-vent length ranged between

34.3-47.6 mm (mean \pm SD = 40.3 \pm 2.0 mm; N = 256), body mass between 5.2-12.4 g (mean \pm SD = 8.84 \pm 1.3 g, N = 256). Body mass was positively correlated with snout-vent length (Spearman's Rho = 0.84, p < 0.001).

The juveniles were moving unidirectionally, from the water towards the land, tending to cluster and following certain paths. During the first night, when the peak migration occurred (18-19 June 2013), road mortality was recorded on a 900 m segment of the dirt road where a total of 799 killed metamorphs were counted. Their location was recorded using a Garmin GPSMAP 62s GPS. ArcGIS Desktop 10.1 (ESRI, CA) was used to generate a 1 m² fishnet and count the number of roadkills in each cell (Fig. 2). During the next two nights the intensity of migration decreased, although numerous juveniles were still present close to the water.

Seven Water frogs, *Pelophylax kl. esculentus* (LINNAEUS, 1758), and *Pelophylax ridibundus* (PALLAS, 1771), were observed preying on *Pelobates* metamorphs on the shoreline (Fig. 3), despite their large size that was, on average, 48.5 % of the water frogs' snout-vent length. This data is based on these seven water frogs and their prey (mean \pm SD: 81.26 \pm 5.15 mm and 39.45 \pm 2.33 mm, respectively). The intensity of predation was nevertheless low, affecting only a very small percentage of the population.

Maximizing reproductive success, while minimizing physiological costs, act as a major selection pressure in amphibian reproductive biology (MCCAULEY et al. 2000). One of the strategies used to minimize predation during reproduction is synchronous metamorphosis (LYTLE 2001). The authors believe that the sudden and synchronous movement of the metamorphs from water to land, despite the differences in body size and developmental stage, diminished the impact of predators and represents a strategy of enhancing reproductive success. Road mortality in natural habitats is an important conservation issue (SILLERO 2008), especially when mortality occurs during massive movement events. The dirt road crosses the migration path of the juveniles and, despite the low traffic load, it poses a significant threat to their survival.



Fig. 1: Mass migration of *Pelobates syriacus* (BOETTGER, 1889) metamorphs in the Danube Delta Biosphere Reserve, Romania.



Fig. 2: Road mortality of *Pelobates syriacus* (BOETTGER, 1889) metamorphs during mass migration. Same location as in Fig. 1.



Fig. 3: A water frog preying on a juvenile *Pelobates syriacus* (BOETTGER, 1889). Same location as in Fig. 1.

ACKNOWLEDGMENTS: The study was supported by the Romanian National Authority for Scientific Research CNCS – UEFISCDI, grant PN-II-ID-PCE-2011-3-0173. The authors thank their colleagues: Sebastian Topliceanu, Ioana Matei and Elena Buhaciuc for help during the field surveys.

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KEY WORDS: Amphibia: Anura: Pelobatidae; *Pelobates syriacus*, metamorphosis, metamorphosis mass migration, mortality, predation, Romania

SUBMITTED: October 6, 2014

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