

Bufo boulengeri: field observations on breeding phenology at a new Saharan site in Southern Tunisia

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Green toads are widespread in the Palearctic region where they have differentiated into several lineages (Roth, 1986; Stöck, Günther and Böhme, 2001; Balletto, Bologna and Giacoma, 2007; Stöck et al., 2008). *Bufo boulengeri* has recently split from the other Palearctic populations of the *Bufo viridis* subgroup (Stöck et al., 2006). The species is distributed across North Africa, from Morocco to Eastern Egypt ranging from the coast into the Sahara where it occurs in many oases (Bons and Geniez, 1996; Borkin, 1999; Frynta et al., 2000; Baha El Din, 2006; Stöck et al., 2006). The southernmost record is near Tamanrasset in the Hoggar (Ahaggar) mountains, southern Algeria (Joger, 1981).

In Tunisia, *B. boulengeri* is mainly distributed in the central and northern parts of the country, but is also found on the islands of Kerkennah and Djerba (Mertens, 1929; Frynta et al., 2000; Sicilia et al., 2009; Stöck et al., 2008). The species prefers open landscapes and is very resistant to drought and salinity. However, within this context, *B. boulengeri* utilises a range of permanent and ephemeral habitats, such as streams, swamps, brackish and freshwater marshes, pools and ponds, and artificial water bodies including, wells, cisterns, agricultural reservoirs, road ditches and concrete reservoirs (Gauthier, 1928; Schleich, Kästle and Kabisch, 1996; Sicilia et al., 2009). The reproductive season of *B. boulengeri* usually takes place from February until May. However, Mertens (1929) suspected two mating seasons (spring and late summer) on Djerba Island, while Sicilia et al. (2006)

observed breeding between the end of autumn and beginning of winter on the Kerkennah Islands during 2005.

Different taxa of the *Bufo viridis* subgroup show different breeding phenologies which may be explained, to some extent, by phylogenetic history (Stöck et al., 2008). Moreover, even the same species can have different breeding phenologies between populations. In Italy, for example, differences between *Bufo balearicus* and *B. siculus* as well as within populations of these species have been reported (Lo Valvo and Giacalone, 2004; Sicilia et al., 2006; Balletto, Bologna and Giacoma, 2007).

In this paper we report on the reproductive phenology of the North African green toad *Bufo boulengeri* in Dghoumes National Park (N 34° 03' 00.09", E 8° 33' 37.30"), near the oasis town of Tozeur on the northern side of the Chott El Jerid, Tunisia. Despite being within its known range, this is a new location record for the species (cf. Sicilia et al., 2009). This 8,000 ha protected area includes a halophytic zone merging with the Chott El Jerid, an intermediate plain of sub-desertic continental steppe (see Le Houérou, 2001; Olsen et al., 2001; Posner, 1988), marked by ephemeral water courses (wadis), and a mountain chain to the north (Woodfine et al., 2009). Although average annual rainfall is low (~100 mm) and



Figure 1. View of the large semi-natural pond in Dghoumes National Park where populations of *B. boulengeri* were discovered.

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Figure 2. Tadpoles at different stages of development and recently-metamorphosed juveniles along the muddy shores of one of the two semi-natural ponds in Dghoumes National Park.

mostly occurring between October and April (IMN, 2009), precipitation is captured in the mountains where there are also naturally occurring springs.

In the foothills of these mountains *B. boulengeri* was found in naturally occurring pools and in two large semi-natural ponds. The latter were formed

after the construction of dams retaining and enlarging areas of standing water along existing wadis (Figure 1). On 24th and 25th October 2009, tadpoles and recently-metamorphosed juveniles of *B. boulengeri* were observed. A year later, on 22nd and 23rd October 2010, along the muddy shores of one of the two semi-natural ponds (the only one with water during this survey), and in the surrounding area, thousands of recently-metamorphosed juveniles (approximate length snout-vent length ca. 20 mm) were observed in activity or hiding under stones and in the muddy soil. In addition, tadpoles at different stages of development and metamorphosed individuals (Figure 2), as well as some adults were observed in the water and among the surrounding vegetation (Figure 3). No spawning was observed as the water was turbid (Figure 2 and Figure 3) following heavy rainfalls while a combination of thick mud and steep terrain did not permit closer examination of the ponds.

In light of our observations and considering that adult toads remain in the water during the mating season, even if they are not about to reproduce (Schleich, Kästle and Kabisch, 1996), it appears that the reproductive period of *B. boulengeri* on mainland Tunisia is longer than previously thought. Indeed, given that the larvae of *B. boulengeri* hatch 3-5 days after egg laying and undergo



Figure 3. An adult *Bufo boulengeri* among the hydrophytic vegetation of a semi-natural pond in Dghoumes National Park.

metamorphosis after 40-45 days (Schleich, Kästle and Kabisch, 1996), it can be assumed that the second reproductive period starts in late summer and continues well into the rainy season. The same has been observed in *Bufo siculus* on the island of Ustica, southern Italy (Sicilia et al., 2006).

Our observations provide additional data on the distribution and ecology of *B. boulengeri* in Tunisia. Like other species of the *B. viridis* group (Geniez et al., 2004), *B. boulengeri* undergoes opportunistic reproductive phenology in ephemeral humid habitats, in order to adjust to the scarce water resources in desert conditions.

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