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Reproduction of *Bufo calamita* during summer season in the Valencia province

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Resumen: El sapo corredor, *Bufo calamita*, es una especie que se reproduce en hábitats temporales y que presenta una elevada plasticidad en cuanto al comienzo, duración y final del periodo reproductor. En las latitudes del sur peninsular la reproducción tiene lugar entre octubre y marzo, mientras que en el norte puede extenderse desde febrero hasta junio. En esta nota describimos indicios reproductivos no incluidos en estos periodos, en el término municipal de Oliva (Valencia), lo que supone una prueba más de la alta plasticidad de esta especie.

The Natterjack toad (*Bufo calamita*), is a species that breeds in temporal wet habitats and shows a high plasticity with respect to the beginning and the end of the breeding season, depending on altitude, latitude, temperature and water availability (Gómez-Mestre, 2014). Banks & Beebee (1986) and Sinsch (1988) reported that long dry periods followed by rain may cause male toads to move to the ponds around two days after the rain, where they form choruses at night.

In the Iberian Peninsula both the beginning and the end of the breeding season are highly variable. Towards the South, spawning starts after the first autumnal rains, or in early winter, with the reproductive peak between January and early March (Díaz-Paniagua *et al.*, 2005). In northern Spain, the reproduction takes place between February and early June (Garin-Barrio *et al.*, 2007), although it may be delayed until May-June in the highest parts of the mountains (García-París *et al.*, 2004). In northern populations, e.g., in Germany, reproduction may start in March and last until late August (Sinsch, 1988).

In this note we describe the observation of two events that demonstrate reproduction of this species during summer months, in the locality of Oliva (Valencia, Spain).

On August 7 2015, at 11:10 pm, we found a group of calling males (Figure 1) including eight individuals in a pond shore (0.004 km^2 and a maximum depth of 0.6 m in a drip irrigation orange fields matrix), observing the same behavior next day at 11:00 pm. The second day we could observe one spawn string already laid but no any ongoing amplexus. No rain events happened around the observation days.

Figure 1: Locality map. 1: pond, 2: old swimming pool.
Figura 1: Localización en el mapa. 1: estanque, 2: antigua piscina.

Later, on 9 October we found several hundred of metamorphic toads and 50 advanced *B. calamita* tadpoles inside a semi-dry old swimming pool (Figure 1) holding in the deepest zone (10 m below ground level) water to a depth equal to 0.75 cm (Figure 2). These metamorphs could not leave the pool by their own. At the same time no metamorph was found in the first pond, and only a few advanced tadpoles were discovered in that locality.

This observation is an evidence for summer reproduction because the embryonic development lasts 5 - 12 days, depending on the temperature, (González de la Vega, 1988), and the larval phase from 24 days in very ephemeral ponds to three months in the northern Iberian Peninsula (Masó & Pijoan, 2011).

Summer reproduction is an interesting behavior at the latitude observed. The proximate cause was probably water availability due to the drip irrigation field systems because it increases the humidity generated after rain and favors toads' displacements and reproduction.

It would be interesting to study whether or not these amphibians remain reproductive outside the expected period in other crops where irrigation conditions are similar. Alternatively, an unknown variable, ignored by us, may have caused the extraordinary reproductive activity during summer.

Figure 2: *Bufo calamita* metamorphs and pre-metamorphs found in early October.
Figura 2: Metamórficos y pre-metamórficos de *Bufo calamita* encontrados a principios de octubre.

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