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Predation of *Bufo calamita* eggs by *Discoglossus pictus* tadpoles

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Fecha de aceptación: 12 de octubre de 2016.

Key words: spawn predation, tadpole aggregation, tadpole competition, intraguild predation.

RESUMEN: El sapillo pintojo (*Discoglossus pictus*) es una especie introducida desde el norte de África que presenta una expansión continua en el noreste de Cataluña y el sur de Francia. En las charcas usadas como punto de reproducción coincide sobre todo con el sapo corredor (*Bufo calamita*), comúnmente considerado su principal competidor nativo. En esta nota informamos de una observación nocturna de un grupo de renacuajos de *D. pictus* alimentándose de una puesta de *B. calamita* en una charca natural cerca del límite sur de expansión de la especie invasora. Posteriores observaciones en charcas cercanas en las que se podría repetir la depredación por la presencia tanto de renacuajos de *D. pictus* como de puestas de *B. calamita* no han dado lugar a observaciones similares, lo que hace pensar a los autores que no se trata de un hecho muy común.

The Mediterranean Painted Frog (*Discoglossus pictus*) is a species native of North Africa and lives in Eastern Morocco, Algeria and Tunis and in the islands of Sicily, Malta and Gozo (Lanza *et al.*, 1986; Pabijan *et al.*, 2012). It was introduced in Banyuls de la Marenda, Southern France, at the beginning of the 20th century (Wintrebert, 1908) and since then, it has expanded north and southwards, with similar rates of spread (Montori *et al.*, 2007; Llorente *et al.*, 2016). It is still expanding (SIARE, 2016), being the southern limit of the continuous expansion found nowadays near St. Celoni (Barcelona Province, NE Spain).

In its invasive range, *D. pictus* usually reproduces in temporary or ephemeral ponds commonly shared with native species with

similar preferences, like *Bufo calamita* or *Pelodytes punctatus* (Montori *et al.*, 2007; Llorente *et al.*, 2016). Concretely, Richter-Boix *et al.* (2013) estimated a niche overlap in breeding areas between *Discoglossus pictus* and *Bufo calamita* of 0.99 over 1, meaning that is it very common to see them as larval competitors in the same ponds. When they share ponds, previous studies suggest a displacement of *B. calamita* to non-preferred food resources and greater competitive abilities of *D. pictus* (San Sebastián *et al.*, 2015a).

On 9th March 2016, approximately at 19:00 h, during a nocturnal survey to check the southern expansion front of *D. pictus*, we found in a pond near La Batllòria (UTM: 31T 4619000m N , 463802m E), a group

of tadpoles of *D. pictus* feeding on eggs of *B. calamita*. As it is common in the species (authors, unpublished data), a great proportion of tadpoles were feeding together on the same part of the foraging resource, in this case, the *B. calamita* spawn (Figura 1, video: <https://www.youtube.com/watch?v=qCB8z-fr69hg>). This clustering behavior is also common in lab experiments (authors, unpublished data; O. San Sebastián, personal communication), where a large proportion of tadpoles compete among them but at the same time probably use the other individuals as reliable indicators of the presence of food.

Tadpoles of *D. pictus* have already been mentioned as predators of their own eggs (Licata *et al.*, 2015) and of *Hyla intermedia* eggs as well (Escoriza, 2014). On the other hand, *B. calamita* eggs are commonly eaten, being prey of *Pelodytes punctatus* and *Pelobates cultripes* (Tejedo, 1991), *Bufo bufo* and *Rana temporaria* (Banks & Beebee, 1987) and *Procambarus clarkii* (Cruz & Rebelo, 2005; Cruz *et al.*, 2006; Portheault *et al.*, 2007), among other species.

In this case, the pond was starting to dry out due to the lack of rain: two weeks later a re-visit to the same reproduction point confirmed it was already empty of water. According to lab studies (San Sebastián *et al.*, 2015b), tadpoles of *D. pictus* prefer resources with high protein contents if they are available. Moreover, these tadpoles are able to grow and develop faster if they forage on highly proteinic resources. Therefore, the simple preference for proteinic resources, plus the need to increase their rates of growth and develop-



Figure 1: A group of tadpoles of *D. pictus* feeding together on a stretch of a spawn of *B. calamita*.

Figura 1: Un grupo de renacuajos de *D. pictus* se alimentan juntos de un trozo de puesta de *B. calamita*.

ment before the pond dried out (Kupferberg, 1997; San Sebastián *et al.*, 2015b), could have led these tadpoles to exploit an unusual resource. Posterior surveys of ponds with the same combination did not yield the same kind of observations. This, and the fact that, after several years of studies on competition among these species, it is the first time that this behavior has been described, makes the authors think that it is not common.

However, the high ecological similarity between these species (Richter-Boix *et al.*, 2013), makes this behavior very interesting in terms of competition: when eggs are laid the same rainy night, *D. pictus* tadpoles hatch and develop faster than *B. calamita* ones (authors, unpublished data), potentially making *D. pictus* a more powerful competitor than thought if this predation events were not to be as uncommon as it seems.

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Polyphalangy incidence in an isolated population of *Pleurodeles waltl* founded in a rural well in the Southwest of Spain

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Fecha de aceptación: 13 de octubre de 2016.

Key words: sharp-ribbed newt, limb deformities, well, rural landscape, southern Spain.

RESUMEN: En este artículo se describen las malformaciones observadas en las extremidades de tres gallipatos (*Pleurodeles waltl*) pertenecientes a una misma población que se localizó aislada en un pozo de la campiña sur de Cádiz (España). Los tres ejemplares, dos adultos machos y una larva de gran tamaño, presentaron polifalanga en uno o dos dedos, según el caso.

Within agricultural landscapes in rural Spain, especially in the east and south, farmers tend to throw sharp-ribbed newts (*Pleurodeles waltl* Michaelles, 1830) into wells, since they believe that these amphibians help to maintain water clean (Barbadillo *et al.*, 1999). In this man-made aquatic habitat, newts can live for years in isolation, feeding themselves on prey that accidentally fall into the well. Moreover, some wells may even support newt populations with breeding success (authors, unpublished data).

During the summer of 2016 we found a rural well in Vejer de la Frontera (Cádiz, southern Spain; UTM coordinates X: 233522; Y: 4018081; 14 masl), and it was sampled for the presence of *P. waltl* on 20th August 2016. The well is circular in shape, with a diameter of 3.45 m, and a depth of 6.1 m. At the time of data collection, the water table of the aquifer was found at 5.5 m below ground level, the water conductivity was 1.187 $\mu\text{S}\cdot\text{cm}^{-1}$, and the pH was 7. The parapet of the well, 50 cm high,