Contribution to the knowledge on the reproductive biology of *Bufo spinosus* in Morocco

Alberto Sánchez-Vialas[1], Octavio Jiménez-Robles[2], Gabriel Martínez del Mármol[3] & Raúl León[4]

[1] Colección de Herpetología, Museo Nacional de Ciencias Naturales (CSIC). Cl. José Gutiérrez Abascal, 2. 28006 Madrid. Spain. C.e: alberto.alytes@gmail.com

[2] Departamento de Biodiversidad y Biología Evolutiva. Museo Nacional de Ciencias Naturales (CSIC). Cl. José Gutiérrez Abascal, 2. 28006 Madrid. Spain.

[3] Cl. Pedro Antonio de Alarcón, 34. 18002 Granada. Spain.

[4] Cl. Estanislao Cabanillas, 43. 2º. 13400 Almadén, Ciudad Real. Spain.

Fecha de aceptación: 9 de julio de 2016.
Key words: distribution, Jbel Sirwa, lotic environment, *Natrix maura*, pigmentary anomaly, reproductive habitat.

Resumen: Se disponen de escasos datos acerca de los lugares de reproducción de *Bufo spinosus* en Marruecos. Aquí aportamos un nuevo registro donde se reproduce la especie en la cordillera del Rif, durante principios de Mayo de 2015. El hábitat reproductivo se caracteriza por ser lótico y sin vegetación acuática, similar a los ambientes que usa en Túnez. Así mismo, constatamos su presencia en la localidad más meridional para la especie.

The *Bufo bufo* species complex (Arntzen *et al.*, 2013) is comprised by several Palearctic species both in the Eurosiberian and Mediterranean biogeographic regions. Recent studies show the presence of two distinct North African lineages of *Bufo spinosus* (Recuero *et al.*, 2012), which should be considered as different units for the conservation of the whole species diversity. Regarding herpetological diversity, Morocco is one of the best known countries in North Africa, but data on natural history, such as reproductive biology, are scarce for some species in the region, as in the case of *B. spinosus* (Schleich *et al.*,1996).

Moroccan populations of *B. spinosus* are confined to the wettest and coolest zones of the country, especially in mountain areas as the Rif, Middle Atlas and the High Atlas, where it seems to be relatively common (Bons & Geniez, 1996; Beukema *et al.*, 2013). It is also found on the Moroccan Mediterranean coast, and on the north Atlantic coast, where it is rare (Bons & Geniez, 1996; Barnestein *et al.*, 2012). The most meridional record of *B. spinosus* in North Africa is in Jbel Sirwa (between High Atlas and Anti Atlas mountains; Bons & Geniez, 1996). In August 2012 an adult female with a yellow pigmentary anomaly was observed during the day in the proximities of a stream (Figures 1a and 1b). This datum is important because lower latitude populations are supposed to be at higher extinction risk by climate change (Franco *et al.*, 2006).

The reported breeding activity of *B. spinosus* in Morocco takes place in spring in the High Atlas (at 2.650 masl), where post-metamorphic individuals have been observed in July (Salvador, 1996). In Tunisia, its breeding season begins in early March and runs through mid-April (Ben Hassine & Escoriza, 2014).

The reproductive habitat of *B. spinosus* in North Africa has been described in: Algeria (temporary ponds vegetated with *Ranunculus*; Samraoui *et al.*, 2012); Tunisia, (lotic environments, such as backwaters areas of streams that lack vegetation and in stream pools; Ben Hassine & Nouira, 2012; Ben Hassine & Escoriza, 2014), and Morocco (a relatively large permanent vegetated pond in the Middle Atlas; El Hamoumi *et al.*, 2007).

During a field expedition conducted in 2015 in the Rif mountains, northern Morocco, on 2 May we found two *B. spinosus* clutches

Figure 1: (a) Habitat in Jbel Sirwa, Morocco, where *B. spinosus* was observed. (b) Female *B. spinosus* with a yellow pigmentary anomaly found in Jbel Sirwa, Morocco.
Figura 1: (a) Hábitat en Jbel Sirwa, Marruecos, donde se observó *B. spinosus*. (b) Hembra de *B. spinosus* con anomalía pigmentaria encontrada en el Jbel Sirwa, Marruecos.

in a lotic environment at 1.027 masl, 9 km SW Moulay Abdeslam, Parc naturel régional de Bouhachem (Figure 2a). Both clutches were laid among dead branches and over alder (*Alnus glutinosa*) roots in a rocky stream that lacks aquatic vegetation. The section of the stream where the clutches were observed was in shade due to the canopy of alders. The reproductive habitat in this locality is similar to the environments used in Tunisia by the other North African lineage of *B. spinosus* (Ben Hassine & Nouira, 2012; Recuero *et al.*, 2012; Ben Hassine & Escoriza, 2014), but in contrast, in Morocco they are known to use more types of reproductive habitats (Salvador, 1996; El Hamoumi *et al.*, 2007). This reflects the lack of information on the natural history of *B. spinosus* Moroccan populations, and the ecological plasticity that this species shows for reproducing in different habitats.

In one of these clutches found in the Rif, an adult of *Natrix maura* was sitting among the strings of eggs (Figure 2b). In Spain, *B. spinosus* eggs have been observed to be predated by *N. maura* (Meijide & Salas, 1989). Therefore, it is quite likely that the same trophic interaction occurs in North Africa. However we did not observe any evidence of damage on the eggs or any try to ingest them, maybe because the snake felt disturbed by our presence.

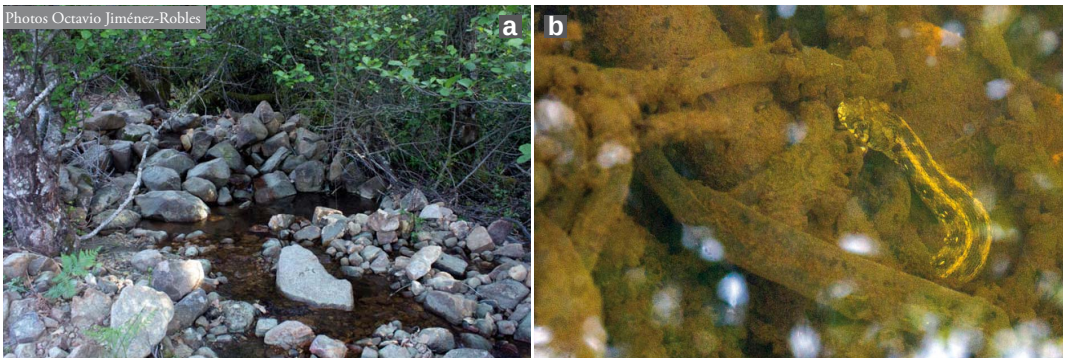

Figure 2: (a) Lotic environment where the clutches of *B. spinosus* were found, near Moulay Abdeslam, Morocco. (b) *Natrix maura* sitting on the clutch of *B. spinosus* near Moulay Abdeslam, Morocco.
Figura 2: (a) Ambiente lótico donde se encontraban las puestas de *B. spinosus*, cerca de Moulay Adeslam, Marruecos. (b) *Natrix maura* sobre una puesta de *B. spinosus* cerca de Moulay Adeslam, Marruecos.

More studies about *B. spinosus* biology in North Africa will be necessary to properly carry out conservation actions for these relict populations that could be considered as Near Threatened (Reques *et al.*, 2013).

References

Arntzen, J. W., Recuero, E., Canestrelli, D. & Martínez-Solano, I. 2013. How complex is the *Bufo bufo* species group?. *Molecular phylogenetics and evolution*, 69: 1203-1208.

Barnestein, J.A.M., Donaire-Barroso, D., Vega, J.P.G.D.L., Valdeón, A. & Mouden, E.H.E. 2012. Contribución al conocimiento de la herpetofauna de marruecos: Nuevos datos corológicos (octubre 2003). *Butlletí de la Societat Catalana d'Herpetologia*, 20: 57-71.

Beukema, W., De Pous, P., Donaire-Barroso, D., Bogaerts, S., García-Porta, J., Escoriza, D., Arribas, O.J., El Mouden, E.H. & Carranza, S. 2013. Review of the systematics, distribution, biogeography and natural history of Moroccan amphibians. *Zootaxa*, 3661: 1-60.

Bons, J. & Geniez, P. 1996. *Anfibios y Reptiles de Marruecos (Incluido Sahara Occidental). Atlas Biogeográfico*. Asociación Herpetológica Española. Barcelona.

El Hamoumi, R., Dakki, M. & Thevenot, M. 2007. Etude écologique des larves d'anoures du Maroc. *Bulletin de l'Institut Scientifique Rabat*, 29: 27-34.

Franco, A., Hill, J.K., Kitschke, C., Collingham, Y.C., Roy, D.B., Fox, R, Huntley, B. & Thomas, C.D. 2006. Impacts of climate warming and habitat loss on extinctions at species' low-latitude range boundaries. *Global Change Biology*, 12: 1545-1553.

Hassine, B.J. & Nouira, S. 2012. Repartition geographique et affinites ecologiques des Amphibiens de Tunisie. *Revue d'Ecologie (Terre & Vie)*, 67: 437-457.

Hassine, J.B. & Escoriza, D. 2014. *Bufo spinosus* in Tunisia: new data on occurrence, parasitism and tadpole morphology. *Herpetological Bulletin*, 127: 22.

Meijide, M. & Salas, R. 1989. Observaciones sobre el comportamiento depredativo de algunos colúbridos ibéricos en estado salvaje. *Doñana, Acta Vertebrata*, 16: 329-332.

Recuero, E., Canestrelli, D., Vörös, J., Szabo, K., Poyarkov, N.A., Arntzen, J.W., Crnobrnja-Isailovic, J., Kidov, A.A., Cogalniceanu, D., Caputo, F.P., Nascetti, G. & Martínez-Solano, I. 2012. Multilocus species tree analyses resolve the radiation of the widespread *Bufo bufo* species group (Anura, Bufonidae). *Molecular Phylogenetics and Evolution*, 62: 71-86.

Reques, R., Pleguezuelos, J.M., Busack, S.D. & de Pous, P. 2013. Amphibians of Morocco, including Western Sahara: a status report. *Basic and Applied Herpetology*, 27: 23-50.

Samraoui, B., Samraoui, F., Benslimane, N., Alfarhan, A. & Al-Rasheid, K.A.S. 2012. A precipitous decline of the Algerian newt *Pleurodeles poireti* Gervais, 1835 and other changes in the status of amphibians of Numidia, north-eastern Algeria. *Revue d'Écologie (Terre & Vie)*, 67: 71-81.

Salvador, A. 1996. Amphibians of Northwest Africa. *Smithsonian Herpetological Information Service*, 109: 1-43.

Schleich, H.H., Kästle, W. & Kabisch, K. 1996. *Amphibians and Reptiles of North Africa*. Koeltz Sci. Books. Koenigstein.

Intento de depredación de un ejemplar de *Triturus marmoratus* sobre un juvenil de *Pelophylax perezi*

Abel Bermejo & Rosa Otero

Ciudad de la Juventud, 106. 34192 Grijota. Palencia. España. C.e: herpeto31@hotmail.com

Fecha de aceptación: 16 de julio de 2016.

Key words: predation attempt, *Pelophylax perezi*, *Triturus marmoratus*, northern Spain.

La dieta de los adultos de *Triturus marmoratus* durante la fase acuática está bien documentada en la bibliografía (Bas, 1982; Lizana *et al.*, 1986; Bea *et al.*,1994; Villero *et al.*, 2006). Está compuesta por invertebrados (crustáceos, larvas de dípteros, tricópteros y efemerópteros) que son las presas más abundantes en los cuerpos de agua, aunque también aprovechan otros recursos tróficos como puestas y larvas de otros urodelos y larvas de anuros (Montori, 1990; Lizana & Martín-Sánchez, 1994; Diego-Rasilla, 2003; Montori & Herrero, 2004; Villero *et al.*, 2006). También se ha citado la depredación sobre adultos de otras especies