

## Consumption of *Daphnia pulicaria* by *Emys orbicularis* in northeastern iberian peninsula

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**Key words:** *Emys orbicularis*, *Daphnia pulicaria*, diet, opportunistic predator.

**RESUMEN:** *Emys orbicularis* está considerado como un galápagos de dieta oportunista y de amplio espectro alimenticio. En este trabajo describimos el consumo reiterado de pulgas de agua por parte de un individuo juvenil de *E. orbicularis* en el nordeste de la península ibérica en el año 2005. El aprovechamiento de estos recursos ocasionales por parte de *E. orbicularis* confirmaría un comportamiento trófico oportunista en esta especie, observado ya en otras especies de galápagos como *Mauremys leprosa* o *Chrysemys picta*.

Information about the diet of *Emys orbicularis* throughout its range is limited. Traditionally it was considered as a strictly carnivorous species (Ernst & Barbour, 1989; Stephens & Wiens, 2003). Recent studies however have shown that is an opportunistic predator with a broad dietary niche (Lebboroni & Chelazzi, 1991, 1999; Rovero, 1995; Ottonello *et al.*, 2005; Çiçek & Ayaz, 2011). In Catalonia (northeastern Iberian Peninsula), *E. orbicularis* presents a highly fragmented distribution with few individuals per population (Llorente *et al.*, 1995; Pleguezuelos *et al.*, 2002). In this area, the population of La Selva County (41°48'39"N/2°42'31"E - WGS84; 78 msnm) is considered the best preserved breeding population (Ramos *et al.*, 2009; Martín, 2010). Since 1986 different conservation projects and monitoring programs have been conducted in this population (Ayres *et al.*, 2013). The area is located in a depression surrounded by mountains near the coast with a Mediterranean climate with frequent winter thermal inversions (Atlantic climate trends). This population is composed of several nuclei or subpopulations located mainly in ponds, wetlands and drainage channels in the hydrographical basin of the Santa Coloma stream (Ramos *et al.*, 2009).

On 19 April 2005, during an interdisciplinary fieldwork in one of *E. orbicularis* subpopulations in La Selva County, we observed during some minutes one juvenile of *E. orbicularis* floating near the pond shore biting continuously to capture large cladocerans from a dense swarm. We captured the juvenile with a mesh net and it was measured and marked according to standardized measures and marking system for the region (Ramos *et al.*, 2009). Captured individual measurements were: nuchal straight-line carapace length (nCl) 64,65 mm, maximum carapace width (Cw2) 56,93 mm and total body mass (Tbm) 55,00 g. After the measurements were taken, the *E. orbicularis* juvenile was immediately released in the same place of capture.

With a 0,30 mm mesh plankton net, we collected a sample of a dense swarm of cladocerans where the individual was captured. Collected zooplankton was immediately preserved in Lugol's solution for further identification. In the laboratory of limnology (University of Girona), we extracted a subsample of the collected zooplankton (n = 200) that was identified as *Daphnia pulicaria*. Body-length of all individuals was measured under binocular micros-

cope, from the base of the tail spine to the top of the helmet according to Burns (1969). The mean body-length was  $2,36 \pm 0,24$  mm.

There are few studies on the diet of *E. orbicularis* (Kotenko, 2000; Zinenko, 2004; Ottonello *et al.*, 2005; Ficetola & De Bernardi, 2006; Ayres *et al.*, 2010; Çiçek & Ayaz, 2011). Small aquatic invertebrates were described in its diet (Lebboroni & Chelazzi, 1991; Rovero, 1995; Ottonello *et al.*, 2005; Çiçek & Ayaz, 2011) but *Daphnia* prey was never reported. Cladocera order and *Daphnia* genus have been detected in the diet of other freshwater turtle species. Despite this, they have been considered accidental in the analysis of the stomach contents of *Phrynops hilarii* (Alcalde *et al.*, 2010) or *Emydura macquarii* (Chessman, 1986). In other species, its presence on the diet may be deliberate, e.g., 39% of presence in *Chelodina longicollis* (Chessman, 1984), and 99% in *Chrysemys picta* (Knight & Gibbons, 1968). The occurrence of *Daphnia* items in the stomachs of *C. picta* corresponds with a peak

abundance of *Daphnia* in August (Knight & Gibbons, 1968). A similar behaviour has been reported in *Mauremys leprosa* with the massive emergence of mayflies or high concentration of clutches of *Bufo spinosus* (Alarcos *et al.*, 2008; De Vries & Marco, 2008).

Our direct observation in the field in which an individual of *E. orbicularis* could benefit of *Daphnia* blooms as a seasonal resource appears to agree with the opportunistic predator behaviour described by Lebboroni & Chelazzi (1999), Ottonello *et al.* (2005), and Çiçek & Ayaz (2011). Despite this limited data, this single observation is particularly important to increase the knowledge on the diet of the species.

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## REFERENCES

- Alarcos, G., Ortiz-Santaliestra, M.E., Madrigal, J., Fernández-Benítez, M.J. & Lizana, M. 2008. Aprovechamiento de la emergencia masiva de efímeras (moscas de mayo) como recurso fácil en la dieta de *Mauremys leprosa*. *Boletín de la Asociación Herpetológica Española*, 19: 40–44.
- Alcalde, L., Derocco, N.N. & Rosset, S.D. 2010. Feeding in Syn- topy: Diet of *Hydromedusa tectifera* and *Phrynops hilarii* (Chelidae). *Chelonian Conservation and Biology*, 9: 33–44.
- Ayres, C., Alvarez, A., Ayllon, E., Bertolero, A., Buenetxea, X., Cordero-Rivera, A., Curco-Masip, A., Duarte, J., Farfan, M.A., Ferrandez, M., Franch, M., Fortuño, L., Guerrero, J., Hernandez-Sastre, P.L., Lacomba, I., Lorente, L., Miguez-Carbajo, D., Pinya, S., Rada, V., Romero, D., Sanchez, J., Sancho, V. & Valdeon, A. 2013. Conservation projects for *Emys orbicularis* in Spain. *Herpetology Notes*, 6: 157–164.
- Ayres, C., Calviño-Cancela, M. & Cordero-Rivera, A. 2010. Water Lilies, *Nymphaea alba*, in the Summer Diet of *Emys orbicularis* in Northwestern Spain: Use of Emergent Resources. *Chelonian Conservation and Biology*, 9: 128–131.
- Burns, C. 1969. Relation between filtering rate, temperature, and body size in four species of *Daphnia*. *Limnology and Oceanography*, 14: 693–700.
- Chessman, B. 1984. Food of the Snake-Necked Turtle, *Chelodina longicollis* (Shaw) (Testudines: Chelidae) in the Murray Valley, Victoria and New South Wales. *Australian Wildlife Research*, 11: 573.
- Chessman, B. 1986. Diet of the Murray Turtle, *Emydura macquarii* (Gray) (Testudines, Chelidae). *Australian Wildlife Research*, 13: 65.
- Çiçek, K. & Ayaz, D. 2011. Food composition of the European pond turtle (*Emys orbicularis*) in Lake Sütlüklü (Western Anatolia, Turkey). *Journal of Freshwater Ecology*, 26: 1–8.
- De Vries, W. & Marco, A. 2008. Depredación de huevos de sapo común (*Bufo bufo spinosus*) por galápagos leprosos (*Mauremys leprosa*). *Boletín de la Asociación Herpetológica Española*, 19: 33–36.
- Ernst, C.H. & Barbour, R.W. 1989. *Turtles of the world*. Smithsonian Inst. Press. Washington.
- Ficetola, G.F. & De Bernardi, F. 2006. Is the European “pond” turtle *Emys orbicularis* strictly aquatic and carnivorous? *Amphibia-Reptilia*, 27: 445–447.
- Knight, A.W. & Gibbons, J.W. 1968. Food of the Painted Turtle, *Chrysemys picta*, in a Polluted River. *American Midland Naturalist*, 80: 558.
- Kotenko, T.I. 2000. The European pond turtle *Emys orbicularis* (L.) in the steppe zone of the Ukraine. *Stapfia*, 69: 87–106.
- Lebboroni, M. & Chelazzi, G. 1991. Activity patterns of *Emys orbicularis* L. (Chelonia Emydidae) in central Italy. *Ethology Ecology & Evolution*, 3: 257–268.
- Lebboroni, M. & Chelazzi, G. 1999. Habitat use, reproduction and conservation of *Emys orbicularis* in a pond system in central Italy. 169–173. In: Boothby, J. (ed.), *Ponds and*

- Ponds Landscapes of Europe*. Proceedings of the International Conference of the Pond Life Project (Maastricht, 30.VIII-2.IX.1998). Maastricht.
- Llorente, G.A., Montori, A., Santos, X. & Carretero, M.A. 1995. *Atlas dels amfibis i rèptils de Catalunya i Andorra*. Edicions El Brau. Figueres.
- Martín, M. 2010. Nueva localidad para *Emys orbicularis* en la provincia de Barcelona. *Boletín de la Asociación Herpetológica Española*, 21:69–71.
- Ottonello, D., Rosecchi, E. & Salvidio, S. 2005. Feeding habits of the European pond terrapin *Emys orbicularis* in Camargue (Rhône delta, Southern France). *Amphibia-Reptilia*, 26: 562–565.
- Pleguezuelos, J.M., Márquez, R. & Lizana, M. 2002. *Atlas y libro rojo de los anfibios y reptiles de España*. Dirección General de Conservación de la Naturaleza. Madrid.
- Ramos, S., Franch, M., Llorente, G.A. & Montori, A. 2009. Morphometry and biological cycle of a European pond turtle (*Emys orbicularis*) population from north-eastern Spain. *Revista Española de Herpetología*, 23: 117–128.
- Rovero, F. 1995. Eco-etologia della Tartaruga palustre, *Emys orbicularis*: uso dell'habitat ed organizzazione dell'attività in una popolazione della Riserva Naturale Monte Rufeno. Tesi di laurea. Univ. di Firenze, Fac. Sc. Mat., Fis. & Nat. Firenze.
- Stephens, P.R. & Wiens, J.J. 2003. Ecological diversification and phylogeny of emydid turtles. *Biological Journal of the Linnean Society*, 79: 577–610.
- Zinenko, O. 2004. Notes on egg-laying, clutch size and hatchling feeding of *Emys orbicularis* in the Kharkiv region, Ukraine. *Biologia Bratislava*, 59: 149–151.

## Nuevas observaciones sobre la ecología de anidación de *Caiman crocodilus* en Caño Negro, Costa Rica

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*Caiman crocodilus*, conocido comúnmente en Costa Rica como “guajipal”, es una especie considerada de talla pequeña a mediana dentro de los crocodilianos, posee una alta capacidad de adaptación a condiciones de salinidad y a alteraciones en el hábitat, y su dieta incluye una amplia variedad de presas (Medem, 1981). En el Refugio Nacional de Vida Silvestre “Caño Negro” (Costa Rica) ocupa bosques inundados y pantanos en la estación húmeda, pero se concentra en los ríos, canales y lagunas durante la estación seca (Allsteadt, 1994; Aranda-Coello, 2014). En cuanto a la ecología de anidación de *C. crocodilus*, se ha estudiado en México y Sudamérica (Álvarez del Toro, 1974; Staton & Dixon, 1977; Gorzula, 1978; Crawshaw & Schaller, 1980; Medem, 1981; Ayarzagüena, 1983; Ouboter & Nanhoe, 1987; Cintra, 1988; Thorbjarnarson, 1990; Magnusson *et al.*, 1995), y las

primeras observaciones en Caño Negro las realizó Allsteadt (1994), quien describió el tiempo de postura, número y tamaño de los huevos, la temperatura de la cámara de incubación, además de realizar observaciones sobre el cuidado parental. Dada la existencia de estas observaciones anteriores, el objetivo del presente estudio fue describir nuevos aspectos de la ecología de anidación de *C. crocodilus* en este mismo enclave natural, tales como el tamaño del nido, materiales de construcción, distancia del nido a la orilla del agua, y áreas de nidificación.

El Refugio Nacional de Vida Silvestre Caño Negro (RNVSCN) se encuentra en la zona Noroeste de Costa Rica (10°54'N y 84°47'O), en la provincia de Alajuela, entre los cantones Los Chiles y Guatuso (Aranda-Coello, 2014). Este refugio corresponde al bosque húmedo tropi-