On the presence of *Hemorrhois hippocrepis* at its North-Eastern distribution limit

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Resumen: Se describe la presencia de la culebra de herradura en la provincia de Girona, en el entorno del Macizo de las Gavarres, con dos nuevas citas hacia el norte, en Llofriu y en la Bisbal de l'Empordà, que podrían indicar una expansión hacia el norte de su área de distribución. Esta especie, más escasa que *Malpolon monspessulanus* y *Rhinechis scalaris* en esta región, llega a ocupar zonas intensamente humanizadas, incluyendo la periferia de la ciudad de Girona, donde es víctima ocasional del tráfico rodado.

The horseshoe whip snake *Hemorrhois hippocrepis* (Linnaeus, 1758) is a colubrid native to the Iberian Peninsula and north-west Africa, appearing from Tunisia to the Anti-Atlas mountains in southern Morocco, with populations of allochthonous origin in some Mediterranean islands, such as Sardinia and the Balearic Islands (Schleich *et al.*, 1996; Álvarez *et al.*, 2010). In the north-east of the Iberian Peninsula its presence is known in large parts of the Catalonian coast, where it reaches its northern limit in Palamós (Llorente *et al.*, 1995; Pleguezuelos & Feriche, 2002). In the mesic regions of North Africa and the south of the Iberian Peninsula it is an abundant species that occupies a wide range of habitats (Bons & Geniez, 1996; Feriche, 2017). However, the horseshoe whip snake is considered scarce in Catalonia, associated with low elevations (below 600 masl) and xero-thermic, open environments (Llorente *et al.*, 1995).

In the present study new data on the distribution and use of habitats of this species in the north-east limit of its range are provided. In Fig. 1a, a specimen from Santa Cristina d'Aro is shown. In Girona the horseshoe whip snake was observed in six municipalities near the coast (maximum distance from coast 28 km), almost completely surrounding the Gavarres massif but without surpassing the Ter river basin (Fig. 1b). Its presence in the interior of the Gavarres massif, much more forested, was not confirmed. All records were at low elevation (range = 30-126 masl, mean = 76 masl, Table 1), in highly anthropized environments. The records of Girona city were at residential zones in the outskirts of the city, where this species occupies gardens, parks, and abandoned lots. The other localities were mixed landscapes, mainly formed by cereal monocultures, with interspersed villages (La Bisbal, Cassà de la Selva, Llofriu, Santa Cristina d'Aro and Palamós) along with small cleared or closed formations of *Pinus halepensis*, *Quercus ilex*, *Q. pubescens*, and *Q. suber*. A part of the records corresponds to individuals run over at the beginning of the summer in paved roads, possibly coinciding with a greater activity of this species and an increase in traffic. These records, together with oral surveys with naturalists, suggest that the horseshoe whip snake is not scarce in the province of Girona, and

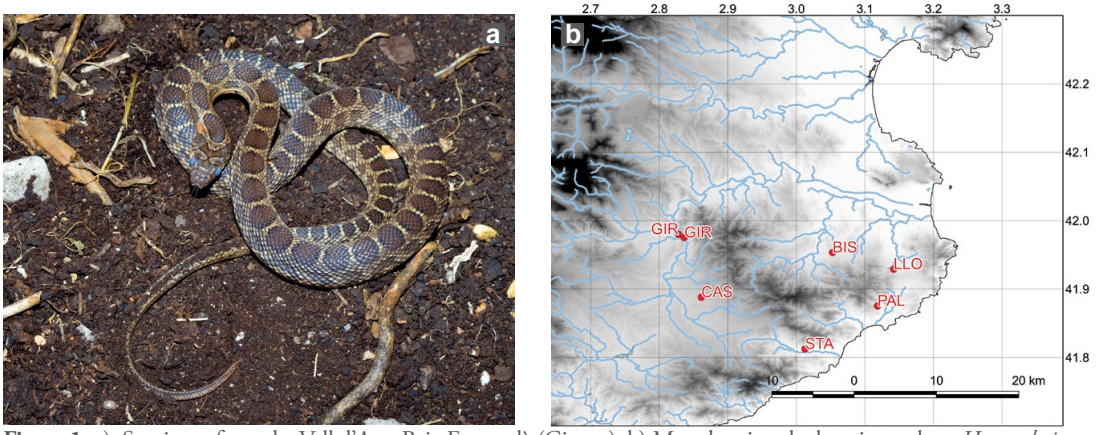

Figure 1: a) Specimen from the Vall d'Aro, Baix Empordà (Girona). b) Map showing the locations where *Hemorrhois hippocrepis* was found in Girona. The abbreviations for each locality are detailed in Table 1.
Figura 1: a) Ejemplar de Vall d'Aro, Baix Empordà (Girona). b) Mapa mostrando las localidades donde se ha encontrado *Hemorrhois hippocrepis* en Girona. Las abreviaturas de las localidades se detallan en la Tabla 1.

that even its populations could be expanding, although it is much less abundant than other species of large terrestrial snakes (*Malpolon monspessulanus* and *Rhinechis scalaris*). Future prospections have to focus on the Montgrí massif and on the Empordà plain (north of the Ter basin) where the species could continue expanding to the north and inside the Gavarres massif, where this species could be present in less densely wooded habitats.

Table 1. Records of *Hemorrhois hippocrepis* collected in this study. DOR = dead on road specimen.
Tabla 1. Registros de *Hemorrhois hippocrepis* recolectados en el estudio. DOR = ejemplar muerto en carretera.

Municipality	Latitude (N)	Longitude (E)	Elevation (masl)	Date	Specimen
Girona (GIR)	41.98	2.82	114	March 2015	Active adult
Girona (GIR)	41.97	2.83	106	May 2016	Active adult
Santa Cristina d'Aro (STA)	41.81	3.01	30	June 2008	Active adult
Cassà de la Selva (CAS)	41.88	2.86	126	July 2017	Adult DOR
Llofriu (LLO)	41.92	3.14	56	July 2017	Adult DOR
La Bisbal (BIS)	41.95	3.05	60	June 2016	Adult DOR
Palamós (PAL)	41.87	3.11	42	May 2005	Active adult

References

Álvarez, C., Mateo, J.A., Oliver, J. & Mayol, J. 2010. Los ofidios ibéricos de introducción reciente en las Islas Baleares. *Boletín de la Asociación Herpetológica Española*, 21: 126-131.

Bons, J. & Geniez, P. 1996. *Anfibios y reptiles de Marruecos (incluido Sahara occidental): Atlas biogeográfico*. Asociación Herpetológica Española, Barcelona.

Feriche, M. 2017. *Hemorrhois hippocrepis*. Culebra de herradura. Enciclopedia virtual de los vertebrados ibéricos. <http://www.vertebradosibericos.org/reptiles/distribucion/hemhipdi.html> [consulta: 17 julio 2018].

Llorente, G.A., Montori, A., Santos, J. & Carretero, M.A. 1995. *Atlas dels Amfibis i Rèptils de Catalunya i Andorra*. El Brau, Figueres.

Pleguezuelos, J.M. & Feriche, M. 2002. Coluber hippocrepis Linnaeus, 1758. Culebra de herradura. 266-268. *In*: Pleguezuelos, J.M., Márquez, R. & Lizana, M. (eds.). *Atlas y Libro Rojo de los Anfibios y Reptiles de España*. Ministerio de Medio Ambiente- Asociación Herpetológica Española (2ª impresión). Madrid.

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