

An update on the distribution of the Horseshoe Whip Snake *Hemorrhois hippocrepis* in northeastern of Catalonia

Daniel Escoriza¹ & Santiago Poch^{1,2}

¹ GRECO. Institute of Aquatic Ecology. University of Girona. Campus Montilivi. 17071 Girona. Spain. C.e.: drdanielescoriza@gmail.com

² Naturalistes del Montnegre i la Tordera. Cl. Farigola, 12. 08398 Santa Susanna. Barcelona. Spain.

Fecha de aceptación: 23 de mayo de 2024.

Key words: climate change, Colubridae, Mediterranean, range expansion.

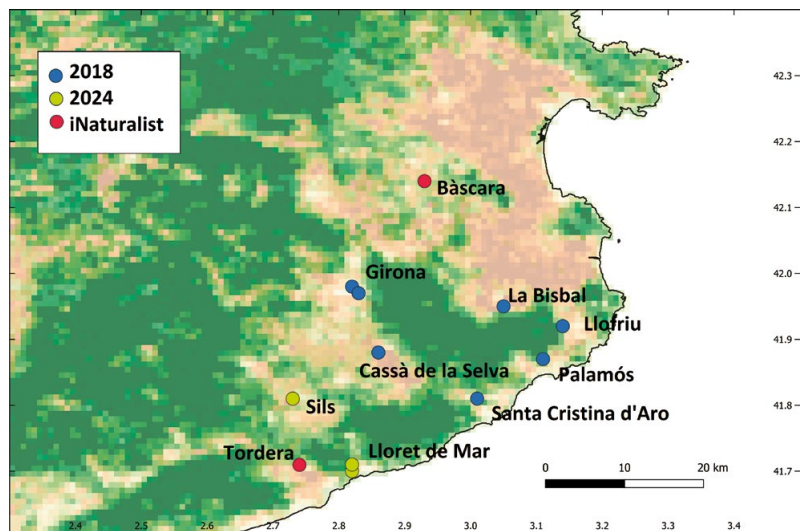
RESUMEN: La culebra de herradura *Hemorrhois hippocrepis* es un colúbrido relativamente raro en el nordeste de Cataluña, pero que podría estar en expansión. En esta nota se recogen nuevas citas que indican que su distribución está extendiéndose hacia el norte y hacia el sur, de forma paralela a la costa Mediterránea.

The Horseshoe Whip Snake *Hemorrhois hippocrepis* (Linnaeus 1758), a colubrid snake native to North Africa and the two southern thirds of the Iberian Peninsula (Schleich *et al.*, 1996), is considered one of the rarest reptiles in the coastal regions of northern Catalonia (Llorente *et al.*, 1995; Escoriza, 2018). The presence of this species in Girona has been documented since 1969 by Palaus and Schmidler (1969) in Palamós (Figure 1). However, this record is not acknowledged by Salvador (1974), who considered that the northernmost distribution limit of

this species was the Valencian coast. Llorente *et al.* (1995) further corroborated the presence of *H. hippocrepis* in the vicinity of Palamós and Comarca de la Selva, extending its range further south. However, they noted that these northern populations are not connected to the southern ones found in the Garraf Massif (Barcelona). Escoriza (2018) documented new occurrences of *H. hippocrepis*, suggesting a range expansion towards the north and northwest (Girona, La Bisbal, and Llofriú) and towards the south and southwest (Santa Cristina d'Aro, Cassà de

Figure 1: Map showing the new records of *Hemorrhois hippocrepis* in northeastern Catalonia. In the background, the vegetation cover is shown (green trees, brown shrubs, and crops) according to Tuanmu and Jetz (2014). Dates of *iNaturalist* records: Tordera (2022) and Bàscara (2023).

Figura 1: Mapa que muestra las nuevas citas de *Hemorrhois hippocrepis* en el noreste de Cataluña. Al fondo se muestra la cobertura vegetal (árboles, arbustos y cultivos) según Tuanmu y Jetz (2014). Fechas de registros de *iNaturalist*: Tordera (2022) y Bàscara (2023).



la Selva) (Figure 1). He hypothesized that this expansion could be potentially driven by climate change (Escoriza, 2018).

This short note presents multiple new occurrences of *H. hippocrepis*, indicating that its range expansion could potentially continue along both fronts parallel to the Mediterranean coastline. These new records include Lloret de Mar and Sils (Figure 1). In Lloret de Mar, the first author (DE) found a dead juvenile on an urban street on October 1st, 2023 (41.7°N ; 2.82°E) and a live adult on August 11th, 2022 (41.71°N ; 2.82°E) (Figure 2). In Sils, an adult individual was photographed on April 13th, 2024, by M. Alba and identified by the authors of this study (41.81°N ; 2.73°E). These individuals were found in urban environments, composed by patches of mixed Mediterranean forest interspersed with houses.

Additionally, we found other new records on *iNaturalist*, a website where amateurs can upload their photos and the taxonomic identification of these images is agreed upon by several experts. Observations sourced from *iNaturalist* indicate that the species has surpassed the Ter basin and is now present in the Alt Empordà region (Bàscara, 42.14°N ; 2.93°E; 12th March, 2023), located 30 km from the French border. Likewise, another record appears in the *iNaturalist* database further south, in the Tordera basin (3rd May, 2022), although geolocated very imprecisely (spatial error of 28 km). This database also contains several recent citations in the vicinity of La Bisbal de l'Empordà, indicating that the species is currently well established north of the Gavarres Massif (first species record in 2018; Escoriza, 2018).

While these new records could also be partially explained by increased survey efforts in the region and citizen science contributions,



Figure 2: Adult individual from Lloret de Mar, La Selva (Girona).

Figura 2: Individuo adulto en Lloret de Mar, La Selva (Girona).

the possibility of a genuine range expansion of *H. hippocrepis* in Girona cannot be discounted. The species' adaptability to anthropogenic habitats, potential advantages arising from the decline of other snake species, the thermophilic nature of this species and gradual temperature rise could be contributing factors (Moreno-Rueda *et al.*, 2012; Duran *et al.*, 2017; Feriche, 2017; Poch *et al.*, 2024). This finding highlights the need for continued monitoring to assess the long-term population trends and conservation status of *H. hippocrepis* in northeast Catalonia.

ACKNOWLEDGMENTS: We are grateful to M. Alba for kindly allowing us to utilize the Sils observation. Additionally, we extend our sincere appreciation to the citizens who contribute their biodiversity records to online platforms like *iNaturalist*.

REFERENCES

- Duran, X., Picó, J. & Reales, L.I. 2017. *Climate change in Catalonia: Executive summary of the Third Report on Climate Change in Catalonia*. Institute of Catalan Studies. Barcelona.
- Escoriza, D. 2018. On the presence of *Hemorrhois hippocrepis* at its north-eastern distribution limit. *Boletín de la Asociación Herpetológica Española*, 29: 37–38.
- Feriche, M. 2017. *Hemorrhois hippocrepis*. Culebra de herradura. Enciclopedia virtual de los vertebrados ibéricos. <<http://www.vertebradosibericos.org/reptiles/distribucion/hemhipdi.html>> [Consulta: 24 abril 2024].
- Llorente, G.A., Montori, A., Santos, X. & Carretero, M.A. 1995. *Atlas dels Amfibis i Rèptils de Catalunya i Andorra*. Ed. El Brau. Figueres.
- Moreno-Rueda, G., Pleguezuelos, J.M., Pizarro, M. & Montori, A. 2012. Northward shifts of the distributions of Spanish reptiles in association with climate change. *Conservation Biology*, 26: 278–283.
- Palaus, J. & Schmidler, J. 1969. Notas para el estudio de la herpetofauna ibérica. *Boletín de la Real Sociedad Española de Historia Natural (Sección Biológica)*, 67: 19–26.
- Poch, S., Escoriza, D., Sunyer-Sala, P. & Boix, D. 2024. *Amfibis i rèptils de Malgrat de Mar: joies de la nostra biodiversitat*. Ajuntament de Malgrat de Mar. Malgrat de Mar. Barcelona.
- Salvador, A. 1974. *Guía de los anfibios y reptiles españoles*. ICONA. Madrid.
- Schleich, H.H., Kastle, W. & Kabisch, K. 1996. *Amphibians and Reptiles of North Africa*. Koeltz Scientific Publishers. Koenigstein. Germany.
- Tuanmu, M.N. & Jetz, W. 2014. A global 1-km consensus land-cover product for biodiversity and ecosystem modelling. *Global Ecology and Biogeography*, 23: 1031–1045.

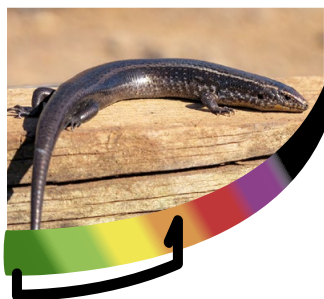
UICN



Cambio de categoría para *Chalcides sexlineatus*, *Gallotia stehlini* y *Podarcis pityusensis*.

La AHE pedirá el cambio de categoría para estos reptiles endémicos en los catálogos nacional y regionales. De este cambio os daremos más detalles en el BAHE 35 (2).

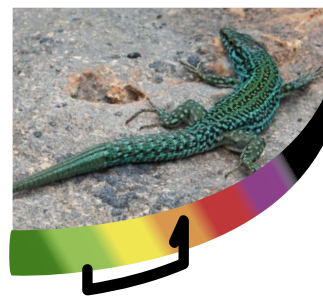
Extinto (EX)	
Extinto Silvestre (EW)	
En Peligro Crítico (CR)	
En Peligro (EN)	
Vulnerable (VU)	
Casi Amenazado (NT)	
Preocupación Menor (LC)	



Chalcides sexlineatus



Gallotia stehlini



Podarcis pityusensis