

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

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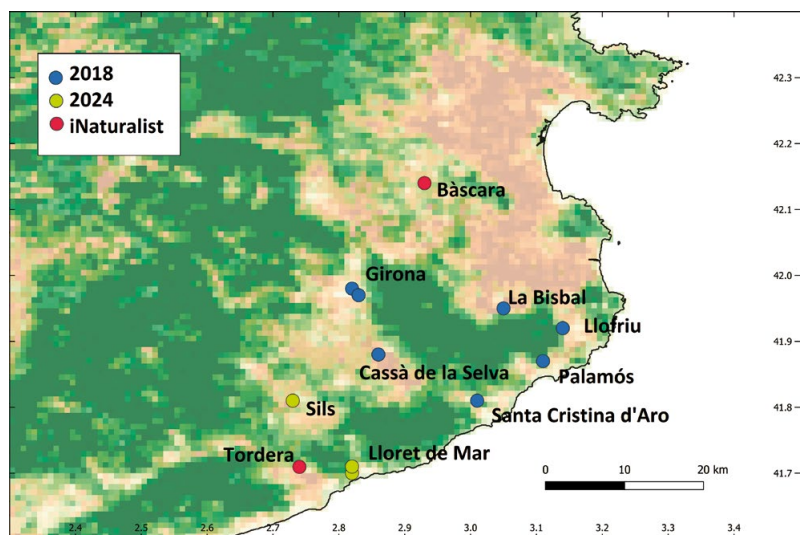
RESUMEN: La culebra de herradura *Hemorrhois hippocrepis* es un colúbrido relativamente raro en el nordeste de Cataluña, pero que podría estar en expansión. En esta nota se recogen nuevas citas que indican que su distribución está extendiéndose hacia el norte y hacia el sur, de forma paralela a la costa 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 Llofriu) and towards the south and southwest (Santa Cristina d'Aro,

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 (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).



Cassà de 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 (Bàsca, 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.

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