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Presence of the horseshoe whip snake (*Hemorrhois hippocrepis*) on Gran Canaria, Spain

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Resumen: Tras 12 años de invasión de la culebra de herradura (*Hemorrhois hippocrepis*) en la isla de Ibiza (Baleares), debido a su transporte en grandes olivos destinados a jardinería, en 2015 aparecieron dos ejemplares de esta especie en el norte de la isla de Gran Canaria, en las inmediaciones de un vivero en el barranco de Casa Ayala, límite entre los municipios de Las Palmas de Gran Canaria y Arucas. Aunque se trata de dos casos aislados, la introducción de esta especie podría tener consecuencias nefastas para su biodiversidad, que ya está amenazada por la invasión de la culebra real de California (*Lampropeltis californiae*).

The horseshoe whip snake *Hemorrhois hippocrepis* (Linnaeus, 1758) is a native species to the western Mediterranean, ranging from the southern Iberian Peninsula to northwestern Africa, and has been introduced in historical times to the islands of Pantellaria, Sardinia and Zembra (Pleguezuelos & Feriche, 2014). It has recently been introduced to the Balearic Islands of Majorca, Ibiza and Formentera (Pinya & Carretero, 2011). These recent introductions are associated with unintentional transportation inside olive trees brought to the Balearic Islands in which snakes travelled as stowaways (Mateo *et al.*, 2011). The rate of the snake's spread from nursery gardens on Ibiza has been rapid: in

Figure 1: Individual of the horseshoe whip snake, *Hemorrhois hippocrepis*, seen on the 15th June of 2015, in the Casa Ayala ravine.
Figura 1: Individuo de culebra de herradura, *Hemorrhois hippocrepis*, vista el 15 de junio de 2015, en el barranco de Casa Ayala. Foto Sistema Alerta Temprana LIFE-Lampropeltis.

15 years it has invaded and occupied half of the island (Montes *et al.*, 2021). Invasive snakes have proven to be a harmful predator for native fauna on islands (Savidge, 1987; Reaser *et al.*, 2007; Jones *et al.*, 2016), and *H. hippocrepis* in particular increases the rate of reptiles in its diet when invading islands, such as Ibiza (Hinckley *et al.*, 2017).

On the 15th June 2015, one specimen of *H. hippocrepis* was photographed in the Casa Ayala ravine (island of Gran Canaria, UTM coordinates X 452161.0031; Y 3112048.328; 25 masl), but not caught. From the picture (Figure 1) it can be deduced that it was an adult snake of around 150 cm total length. Later, on the 6th August 2015, the invasive species control team of the Canary Islands Government captured a specimen in the same area (UTM coordinates X 452086.1678; Y 3111472.72; 46 masl). This snake was a male, 1350 mm from snout to vent and 1640 mm total length, although the last part of the tail was missing. With 724 g of body mass, it surpassed the maximum weight (550 g) known from the native range in the Iberian Peninsula (Pleguezuelos & Feriche, 2014), but it was lower than the species record, an individual captured on Ibiza that weighed 1200 g. Both photographed individuals were not the same, as the latter exhibited melanism (Figure 2). There is a nursery in the same zone where these two snakes were found, but the owner claims not to have imported olive trees for over ten years.

Within its native range, the horseshoe whip snake feeds almost exclusively on vertebrates, mammals and reptiles, but also on birds and invertebrates (Pleguezuelos & Moreno, 1990). On Ibiza, the invasive horseshoe whip snake finds an auspicious environment to thrive (Hinckley *et al.*, 2017). Gran Canaria characteristics are not so different to Ibiza's in terms of landscape (numerous stone walls near human dwells), absence of snake predators and potential preys not used to snakes that fit well with the diet of this snake (Pleguezuelos & Feriche, 2014); the climate of this island is also suitable for the species, as it inhabits the African Macaronesian region in front of Canary Islands (Bons & Geniez, 1996). The island of Gran Canaria has already suffered a colubrid invasion from a species with similar characteristics but very different origin (from pet keepers), the California kingsnake (*Lampropeltis californiae*) (Monzón-Argüello *et al.*, 2015). Its successful establishment suggests the impact on biodiversity that another invasive snake, like *H. hippocrepis*, would presumably have: the diet of the California

kingsnake is based, in the invaded territory, on a 94% of reptiles, 81% being two endemic lizards (Monzón-Argüello *et al.*, 2015).

The horseshoe whip snake is not a common species in the pet trade, being a protected species and its possession being forbidden, at least in Spain (Law 42/2007, of December 13, on Natural Heritage and Biodiversity). Therefore, we dismiss the possibility that these individuals were released as pets. The fact that it had been more than 10 years since the last importation of olive trees took place, and that it is the first time that this species has been seen, suggests that there were few entrances of *H. hippocrepis* to Gran Canaria. Nevertheless, these findings rather uncover concerns on the integrity of the native and endemic fauna of the island, as these individuals survived growing as much as possible, as they do on Ibiza, where gigantism has also been recorded (Montes *et al.*, 2015). The same Canarian nursery imported 42 more olive trees approximately a year after the findings, and there are other nurseries on the island currently importing olive trees from the Iberian Peninsula. Therefore, it is recommended that the environmental authorities take special care in avoiding new entrances (especially avoiding those of big olive trees during hibernation and egg laying seasons), given the successful settlement for a similar species in the same habitat, the invasive *L. californiae* (Monzón-Argüello *et al.*, 2015), and the invasiveness showed by *H. hippocrepis* on other islands (Ayllón, 2015; Montes *et al.*, 2021).

Figure 2: Individual of the horseshoe whip snake, *Hemorrhois hippocrepis*, captured on the 6th August 2015, in the Casa Ayala ravine.
Figura 2: Individuo de culebra de herradura, *Hemorrhois hippocrepis*, capturado el 6 de agosto de 2015, en el barranco de Casa Ayala. Foto J. Saavedra Bolaños (equipo de control de especies invasoras, *Gesplan*).

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Los lagartos endémicos en la dieta de los hurones asilvestrados en Canarias: impacto en la conservación

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En las Islas Canarias (13º23' - 18º8' W / 27º37'- 29º24' N; España) habitan especies y subespecies endémicas de lagartos del género *Gallotia* (Lacertidae) (Pleguezuelos *et al.*, 2002), endémico de este archipiélago (Gobierno de Canarias, 2021a). En las islas de La Gomera y Tenerife se encuentran especies de lagarto tizón; en La Gomera *Gallotia caesaris gomerae* y en Tenerife *Gallotia galloti*, ambas incluidas en el Convenio de Berna. Además, existen especies de lagarto gigante catalogadas en peligro de extinción, como *Gallotia bravoana* en La Gomera (Ley 4/2010, de 4 de junio, del Catálogo Canario de Especies Protegidas) y *Gallotia intermedia* en Tenerife (Gobierno de Canarias, 2021a).

Se ha observado que ejemplares del género *Gallotia* forman parte de la dieta de depredadores introducidos, como es el caso del gato cimarrón (Medina & Nogales, 1993). En estas islas existen también poblaciones de hurón (*Mustela putorius furo*, Mustelidae) asilvestrado, carnívoro catalogado como especie "introducida invasora" (Gobierno de Canarias, 2021b). El hurón se cita naturalizado en La Gomera y La Palma, y recientes datos y publicaciones también lo confirman en la isla de El Hierro, sumándose los avistamientos en Gran Canaria y Tenerife (Gobierno de Canarias, 2021b).

Con estos antecedentes, se realizó un estudio cuyo objetivo consistió en analizar el posible papel de los hurones como depreda-