
Is reproductive ecology behind the success of an invasive snake on a Mediterranean island?

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Abstract

In 2003, three snake species native to the South Iberian Peninsula, entered Ibiza Island for the first time. Since its arrival 15 years ago, *Hemorrhois hippocrepis*, the Horseshoe Whip Snake, has continued to thrive well on the island and poses a threat to the endemic Ibiza Wall Lizard, *Podarcis pityusensis*, and potentially to 9 bat species and 57 bird species, all native and some of them listed as threatened. Here, we analyze its reproductive ecology to unravel whether it may be behind its invasive success. Particularly, we studied 545 specimens from the invasive population (224 females, 261 males and 60 immatures) and analyzed sexual dimorphism, body size at maturity, reproductive cycle, fat-body levels of both sexes, clutch size, newborn characteristics (size, sex ratio and weight) and female reproduction frequency of the Ibizan population, comparing these traits to those exhibited by the source population, on the south of the Iberian Peninsula. Surprisingly, Ibizan invasive Horseshoe Whip snakes are less efficient in general than those from the source population regarding this key aspect of its natural history, the reproduction. The size at maturity is rather similar between populations, with some invasive females maturing at smaller sizes than those from the source population. The reproductive cycle in both sexes is essentially similar between populations, perhaps with a temporal extension in the invasive population (earlier spermatogenesis and vitellogenesis). However, albeit the higher lipid reserves of the Ibizan snakes, more allochthonous than autochthonous females skip opportunities to breed in sequential years, and the same for some males, the latter unseen in the source population. Moreover, in spite of the larger body size of invasive females, they do not have larger clutch sizes than individuals of the source population. We conclude that reproductive ecology is not responsible for the success of the invasive population, leaving only one explanation, after having also studied its diet and predation pressure: the enemy release hypothesis.

Keywords: Ibiza, invasive species, *Hemorrhois hippocrepis*, *Podarcis pityusensis*, reproduction

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