

Reptile behaviour in natural refuges - 2. Cloacal rubbing in cohabiting Montpellier snakes *Malpolon monspessulanus* and ladder snakes *Zamenis scalaris*, a novel courtship behaviour with phylogenetic and ecological implications, with links to video evidence

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Phylogenetic analyses of snake courtship behaviours have shown that many ritualised displays follow lineage-specific evolutionary trajectories (Senter et al., 2014). Within the superfamily Colubroidea, chin-rubbing and head-jerking appear ancestral and widespread, whereas other behaviours such as cloacal gaping or tail quivering are scattered and clade-dependent. Among these tactile displays, cloacal rubbing remains largely undocumented but may represent an underreported element of this range of tactile courtship-behaviours. Alongside these behaviours, chemical signals facilitate mate attraction and assessment, with cloacal secretions and cutaneous lipids playing key roles (Mason & Parker, 2010).

Following an eight-year field study (2018–2025) in the Osona region (42.0144° N, 2.2840° E) of north-eastern Spain, I present here an extension to this range of behaviours by reporting novel observations of courtship, including cloacal rubbing and tail-based tactile displays, in the ladder snake *Zamenis scalaris* and Montpellier snake *Malpolon monspessulanus*. These behaviours, rarely documented in the wild, have not previously been described for either species nor have they been mapped phylogenetically. They may represent divergent tactile strategies in sympatric species with contrasting phylogenetic positions Colubrinae (*Z. scalaris*) and Lamprophiidae (*M. monspessulanus*).

On 24 May 2020, a male *M. monspessulanus* was observed outside the refuge and was filmed by video camera performing sustained cloacal rubbing against a female's head, neck and dorsum during courtship (Fig. 1; [BHS video, 2026a](#)), and more intensely so when a rival male appeared nearby. The male combined this with chin-pushing to guide the female deeper into the refuge, suggesting a potential mate-guarding function. This created a co-ordinated tactile display comprising: 1) chemical signalling via cloacal contact, 2) physical guidance, and 3) spatial control of the mating environment. Subsequent footage suggests that copulation did occur eventually.

This pattern, observed during the mating ritual, adds a previously undocumented tactile component to courtship in the Lamprophiidae, which may have remained unnoticed due to the secretive nature of these interactions. Its rarity in the literature likely reflects the behaviour's cryptic nature rather than its absence. Cloacal rubbing in this context may



Figure 1. A male *Malpolon monspessulanus* cloacal rubbing the body of a female, this is a still frame taken from [BHS video \(2026a\)](#)

serve multiple functions. It could involve the transfer of male pheromones onto the female to reduce her attractiveness to rival males (Mason & Parker, 2010), although other males continued to visit the site. Alternatively, it may also play a stimulatory role within the courtship sequence.

On 3 June 2021, an adult *Z. scalaris* was recorded in and close to the refuge by an infrared-triggered video camera (Serrano-Fochs, 2026). It raised its tail and rubbed its cloaca against its head and dorsum ([BHS video, 2026b](#)). The same individual was also recorded dragging its cloaca against the substrate within

the refuge. These actions may function in scent deposition or self-marking, similar to the ancestral chin-rubbing behaviour documented in Colubrinae (Senter et al., 2014), but with the cloaca, known to be a richer source of semiochemicals (Mason & Parker, 2010), as the effector organ. Notably, a copulation event between two *Z. scalaris* individuals was recorded the same day, suggesting a possible link between cloacal rubbing and reproductive synchronisation, although the role of the marked individual remains unclear. This observation, when compared with that on *M. monspessulanus*, highlights how ritualised tactile behaviours may diversify as adjuncts to chemical communication in snakes.

Additional observations during the 2025 field season revealed further instances of cloacal rubbing in *Z. scalaris*. This included a recording made on 30 May 2025, filmed within the refuge by the camera, and showing an individual rubbing its cloaca on a female *M. monspessulanus* (BHS video, 2026c). This interspecific interaction has not been reported previously, and several hypotheses may explain this unusual behaviour:

1. Chemical interference, whereby *Z. scalaris* attempts to mask or overwrite the pheromonal signals of a heterospecific female, potentially disrupting mating opportunities for conspecifics or to reduce her detectability to rivals. This behaviour could be adaptive in high-quality refuges used by both species for shelter, courtship and oviposition (Serrano-Fochs, 2019), though direct evidence of competitive pheromone masking in snakes remains undocumented.
 2. Phylogenetic plasticity, reflecting the evolutionary predisposition of Colubrinae to perform ritualised rubbing (e.g. chin-rubbing), which may allow novel tactile interactions to emerge under sympatric conditions.
 3. Signal confusion, due to high snake density and overlapping chemical cues within the shared refuge, possibly leading *Z. scalaris* to misidentify a heterospecific as a conspecific. This interpretation aligns with Mason & Parker's (2010) observation that snakes may follow heterospecific scent trails to locate optimal refuges, potentially facilitating accidental interspecific interactions in dense assemblages.
- In a separate event recorded on 4 June 2025, cloacal rubbing by *Z. scalaris* was also directed toward a conspecific targeting the posterior region (BHS video, 2026d), potentially serving as a tactile signal involved in social, competitive or reproductive contexts.

Although phylogenetic analyses suggest that some tactile courtship behaviours may have origins in ancestral combat-related displays (Senter et al., 2014), the evolutionary pathways and relationships for cloacal rubbing remain unknown, which leaves unresolved whether cloacal rubbing was present in the common ancestor of *M. monspessulanus* and *Z. scalaris*, or whether it evolved independently in each lineage. What emerges clearly is that shared ecological pressures, particularly for high-quality reproductive refuges, can promote the expression of similar courtship components even among distantly related species. The tactile strategies observed in these sympatric snakes may reflect either evolutionary convergence or lineage-specific elaborations of a conserved behavioural trait. Notably, while both species

use cloacal rubbing in courtship, a likely case of evolutionary convergence driven by shared ecological pressures, the specific tactile tactics differ, suggesting some lineage-specific modification or elaboration of an ancestral behaviour.

These findings underscore three key insights: 1) the need for further comparative studies to elucidate the evolutionary pathways of tactile courtship; 2) the functional relevance of underreported behaviours like cloacal rubbing within snake reproductive systems; and 3) the critical importance of long-term, in-situ monitoring for detecting rare but evolutionarily significant behavioural adaptations in natural habitats.

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