

First case of nectarivory in *Podarcis liolepis* (Squamata: Lacertidae)

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Plant feeding in the genus *Podarcis* is known mainly from islands, where for example *Podarcis lilfordi* is known for its nectarivorous and frugivorous diet leading to pollination and seed dispersal (Pérez-Mellado and Casas, 1997; Pérez-Mellado et al., 2007). In France, a first case of nectarivory in the genus *Podarcis* has recently been reported on an islet in Marseille (Île du Grand Rouveau), with *P. muralis* (Laurenti, 1768) consuming nectar from *Lotus cytisoides* (Linné, 1753) (Cheylan and Rivière, 2020). Small islands can sometimes lack food resources, which forces reptiles to a high variability in their diet, ultimately using plant resources (Herrel et al., 2008). However, plant food interactions on the mainland are rarer, although some opportunistic *Podarcis* species may consume fruit from humans (Deso, 2014; Mačát et al., 2015). Recently, a case of florivory in *P. liolepis* (Boulenger, 1905) was reported in Spain where an individual pulled off and ingested a flower petal of *Lantana camara* (Linnaeus, 1753) (Van Den Berg, 2011). The Catalan lizard *Podarcis liolepis cebennensis* Guillaume & Geniez in Fretey, 1986 is a French endemic subspecies (Geniez and Crochet, 2003) widespread in the Occitan region but was discovered in 2007 in a new region (Provence-Alpes-Côte d'Azur), in the Vaucluse department, in the commune of Mornas, east of the Rhône river (Geniez et al., 2008). At present, only three populations of this species are known to exist

east of the Rhône River, which constitutes an originality and confers a high heritage value on these populations.

On 28 October 2022, a thermoregulating young male was observed at the foot of a mature pre-flowering shrub *Rhamnus alaternus* (Linné, 1753), during a targeted survey of the Mornas population which is found in cliff and scree habitats (WGS84: 44.205881°N, 4.730066°E). During the observation by two authors (GD and PSB), the young male went to the pre-flowering clumps of *Rhamnus alaternus* and carefully examined them (Fig. 1A) before lapping some of them (Fig. 1B). On closer inspection of the pre-flowering clumps, we realised that many buds were being pulled off and potentially consumed. The lizard spent about 25 seconds extracting juices from selected buds. It should be noted that, given the mild temperatures of autumn 2022, other plant species were also in pre-flowering or even flowering, such as *Juniperus oxycedrus* (Linné, 1753), *Vinca major* (Linné, 1753), *Lathyrus latifolius* (Linné, 1753) and *Saponaria oxymoides* (Linné, 1753). *Rhamnus alaternus* is a dioecious shrub typical of Mediterranean scrubland (Aronne and Wilcock, 1994). The male flowers produce a lot of pollen and the females a moderate amount of nectar (Ricciardelli d'Arbore and Intoppa, 2000). Its flowers and fruits are highly valued by hymenoptera, birds and mammals (Bas et al., 2006, 2009; Rico-Guzmán et al., 2012; Canale et al., 2015). This Mediterranean shrub, which is known for its antioxidant properties (Gadouche et al., 2022), provides a food resource for wildlife at a time of year when resources are scarce (Canale et al., 2015).

In order to identify the presence of sugary matter in pre-flower buds, we performed the flushing extraction protocol mentioned by Marrant et al. (2009); using a 0-90% HHTEC refractometer at an ambient temperature of 20 degrees. Nectar was sampled from 0.2 grams of pre-bud with a 2 ml wash of deionised water in a sterile 20 ml flask (protocol taken from Power et al., 2017). The flask was shaken for 1 minute. We replicated this protocol twice with two different groups of clumps in the autumn. According to Power et al. (2017), this

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Figure 1. (A) Male *Podarcis liolepis* that is closely inspecting the pre-flowering bud of shrub *Rhamnus alaternus*. (B) Collection of nectar. Photographs by Grégory Deso.

technique is both effective and provides the most accurate data of fauna obtained resources when the floral clusters have a small amount of nectar. Results showed that the bud contents were positive for sugar presence, with a fairly low Brix measurement (1 degree Brix = 1 gr sucrose in Aronne and Malara, 2019) in autumn at 0.3 and 0.2% sugars in 2 ml of fluids. Using new DNA metabarcoding techniques (Martins et al., 2022), it would be interesting to carry out an analysis of faeces at several periods of the year in order to better understand the extent of the plant diet of *P. liolepis* on continental populations as suggested by Bassitta et al. (2022). As this lizard is particularly active throughout the year (Geniez and Cheylan, 2012) and the flowering of *Rhamnus alaternus* takes place partly in winter, it is possible that this Mediterranean shrub also provides it with a winter food resource, from the floral pre-buds. A better understanding of the role of fruit, nectar or other plant material in the diet of *P. liolepis* could help guide possible conservation actions.

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