

## Letter to the Editor

# First record of geckos visiting flowers in the Palearctic Ecozone

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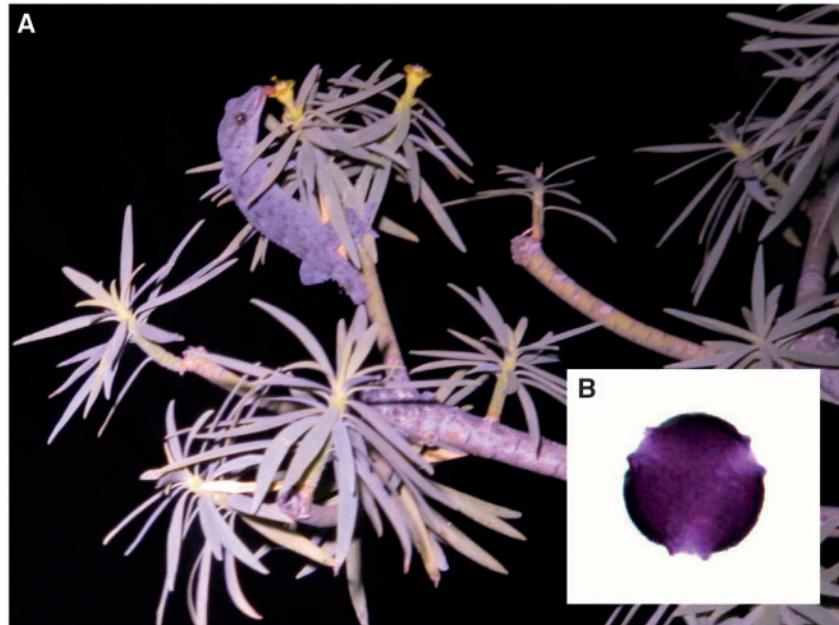
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Pollination networks on islands are often characterized by less complexity than comparable continental environments (Olesen and Jordano 2002). Furthermore, they sometimes include novel generalist-feeding nonspecialist pollinators, including birds in particular (e.g., Olesen 1985 and references therein). This ecological process has been commonly interpreted in a context of depauperation of insular faunas and interaction release (Traveset et al. 2015). The intervention of lizards as opportunistic flower visitors has also been reported (see Olesen and Valido 2003 and references therein). It is known that diurnal lizards (e.g., Family Lacertidae and Phyllodactylidae) visit flowers relatively often in tropical, subtropical, and temperate island environments (see references in Supplementary Table 1). There are however no data about visits by geckos in the Palearctic Ecozone, where they are widely considered as insectivorous (López-Jurado et al. 2016). Interactions of different continental Sauria species visiting flowers are usually considered scarce, being more frequent on islands (see reviews by Olesen and Valido 2003). This includes the Macaronesian islands (see review by Valido and Olesen 2010). According to these authors, some families are quantitatively important partners in these interactions. Examples are Lacertidae in subtropical and temperate latitudes, and different families of Gekkota, basically in tropical zones. However, as far as we know, no interactions between geckos and flowers have been described in the Palearctic Ecozone, including the Macaronesian islands (Madeira, Selvagens, Canaries, and Cabo Verde), where this Sauria family is distributed and has evolved. The gecko species in these archipelagos are mostly considered clearly insectivorous (Yanes and Godoy 1999; Salvador 2009 and references therein). However, consistent herbivory for large insular *Tarentola* has already been reported in Cabo Verde based on food remains and

metagenomics (Pinho et al. 2018). In the surrounding continental zones, geckos have also shown a clear pattern of insect consumption, both in the South of the Iberian Peninsula (see review of Hódar et al. 2006) and North-western Africa (López-Jurado et al. 2016). During a nocturnal survey in April 2016 to search for the presence of the giant endemic grasshopper *Acrostira euphorbiae*, in the Southwestern zone (Tamanca) of the island of La Palma (Canary archipelago), one of us (D.H.T.) recorded at least 4 individuals of *Tarentola delalandii* on *Euphorbia lamarckii* shrubs (Euphorbiaceae). This gecko is endemic to this island and also Tenerife. Although at first they were assumed to be hunting nocturnal insect visitors on flowers, we decided to study these first observations in more detail. Up to the present, it appears that no study has discovered any interaction of geckos visiting flowers in the Palearctic Ecozone. The different species have hitherto been considered as clearly insectivores.

In the spring of 2017, it was confirmed that this gecko visited flowers of *E. lamarckii* to lick the nectar (Figure 1; Supplementary Table 2). Our observations in 2017 took place at the end of the season, and perhaps for that reason only a few pollen grains were observed on the geckos (Supplementary Table 2). Consequently, the study was repeated early in the flowering season in 2018, when a total of 21 (70%) of the 30 captured geckos carried pollen grains (see details about methods in Supplementary material). Pollen from at least 14 plant species was identified. The most frequent pollens were from *E. lamarckii*, *Erica* sp. “pollen type” (Ericaceae), and *Rumex* cf. *lunaria* (Polygonaceae). *Euphorbia lamarckii* was the most represented in each sample, with more than 5 pollen grains in 4 samples (13.3%). It was also interesting to note that on 1 gecko a total of 268 pollen grains of *Echium brevirame* (Boraginaceae) were



**Figure 1.** (A) *Tarentola delalandii* visiting a flowering plant on the island of La Palma (Canary archipelago). (B) Detail of *E. lamarckii* pollen grain.

recorded. Furthermore, pollen from at least another 11 plant species (or pollen types) was also identified in the gecko smears from 2017 to 2018.

A total of 20 species of native geckos have been recorded as flower visitors on a global scale (Supplementary Table 1). These species are included in 11 genera and 3 families (Diplodactylidae, Gekkonidae, and Phyllodactylidae). Twelve are diurnal (60%), 6 nocturnal (30%), and 2 show both periods of activity. Most of these species ( $n=13$ ) are distributed in the Afrotropical Ecozone, 5 in Australasia, 1 in Oceania, and this new interaction (La Palma, Canaries) in the Palaearctic. Of the 20 species, 9 live on continental islands, 6 on oceanic islands, 4 on islands of mixed origin, and just 1 from a mainland area (South Africa). In most cases, the real effectiveness as pollinators of these flower visitors has not been assessed. This would be valuable information in the future, as is the new interaction here described. This short contribution, based on this endemic insular gecko, offers us an interesting ecological lesson in the “cryptic” biology that takes place at night. It underlines the importance of gathering more nocturnal observations, since they may reveal many more ecological roles. Lastly, due to the lack of observations of geckos visiting flowers in the Palaearctic Ecozone, nocturnal prospectations focused on several flowering plants would be worthwhile in future studies. In fact, a gecko of the same species was recently filmed licking nectar from *E. canariensis* on the nearby island of Tenerife (H. López, personal communication).

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## Supplementary Material

Supplementary material can be found at <https://academic.oup.com/cz>.

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