

## An introduction of *Podarcis sicula* in Catalonia (NE Iberian Peninsula) on imported olive trees

Xavier Rivera<sup>1</sup>, Oscar Arribas<sup>2</sup>, Salvador Carranza<sup>3</sup> & Joan Maluquer-Margalef<sup>1</sup>

<sup>1</sup>Societat Catalana d'Herpetologia: Museu de Zoologia, Passeig Picasso s/n. 08003 Barcelona.

[xavirivera@yahoo.es](mailto:xavirivera@yahoo.es) ; [jmaluquer@gmail.com](mailto:jmaluquer@gmail.com)

<sup>2</sup>Avinguda Francesc Cambó 83. 08003-Barcelona. [oarribas@xtec.cat](mailto:oarribas@xtec.cat)

<sup>3</sup>Institut de Biologia Evolutiva (CSIC – UPF): Passeig Marítim de la Barceloneta, 37-49. 08003 Barcelona. [salvador.carranza@ibe.upf-csic.es](mailto:salvador.carranza@ibe.upf-csic.es)

**Resum:** S'han localitzat diversos exemplars de sargantana italiana (*Podarcis sicula*) en un viver de jardineria dins el terme municipal de Sant Celoni (Vallès Oriental, Barcelona). Els especímens semblen del morfotipus meridional (“sicula”, reticulat, present a Sicília, Sardenya, sud d'Itàlia, Menorca i Dubrovnik). Una curta seqüència del gen mitocondrial 12S d'un individu corrobora la procedència geogràfica de la sargantana. D'altra banda, els responsables del viver han confirmat l'origen calabrès de les oliveres, dins de les quals haurien trobat refugi les sargantanes.

En el mateix garden s'ha observat, en oliveres procedents d'Extremadura, exemplars de *Timon lepidus* i de *Tarentola mauritanica*, d'origen incert.

**Abstract:** Several specimens of Italian wall lizard (*Podarcis sicula*) were found in a garden center in Sant Celoni (Vallès Oriental, Barcelona). The specimens can be confidently assigned to the Italian meridional morphotype (“sicula” type, reticulated and present in Sicily, Sardinia, southern Italy, Menorca and Dubrovnik). A short sequence of the 12S rRNA mitochondrial gene from one specimen supports this hypothesis. The lizards arrived inside old olive trees imported from Calabria.

In the same garden several specimens of *Timon lepidus* and *Tarentola mauritanica* of uncertain origin have been found in olive trees imported from Extremadura (South eastern Spain).

**Paraules clau:** *Podarcis sicula*; *Olea europaea*; introducció; centre de jardineria; Catalunya; Península Ibèrica; Itàlia.

**Key words:** *Podarcis sicula*; *Olea europaea*; introduction; Garden center; Catalonia; Iberian Peninsula; Italy.

### INTRODUCTION

The Italian wall lizard, *Podarcis sicula*, inhabits a wide area of the northern shores of the central Mediterranean region. Its distribution is centered in the Italian Peninsula, considered to be its area of origin, being present also in the nearby large islands of Sicily, Sardinia and Corsica, in the northern part of the balcanic Adriatic coast as well as in many Adriatic islands. Moreover, this species has been introduced into several places across the Mediterranean region (Portugal, Spain, France, Montenegro, Turkey, Libya, Tunisia) and the USA (Philadelphia – already extinct; Kansas and more recently in Long Island and Los Angeles) (Behler & King 1979; Conant, 1959; Corti

& Lo Cascio, 2002; Deichsel & Miller, 2000; Deichsel et al. 2010; Gorman *et al.* 1975; Henle & Klaver, 1986; Radovanović 1956).

The colonizing ability of *P. sicula* is facilitated by its presence in humanized coastal areas as fishing ports and city harbors from where it gets into small fishing boats (Radovanović, 1960), merchandise containers and other cargo, as for instance Mediterranean garden species (Brueckers, 2003, 2006; Valdeón et al., 2010). It is also possible that, in the case of large trees, the animals are transported inside the trees from places which are far away from their origin point.

In the Mediterranean region, *Podarcis sicula* has been introduced in Toulon and Château d'If Island in France (Morgue, 1924; Orsini, 1984), Istanbul and several islands of the Marmara sea in Turkey (Basoglu & Baran, 1977) and in the Mediterranean North African shores of Tunisia and Libya (Tripoli) (Arnold & Ovenden, 2002).

There are several records of introductions in the Iberian Peninsula, from where it was first recorded in the gardens of the city port of Almeria (Mertens & Wermuth, 1960). Valverde (2005) described in detail the history of this introduced population. At the beginning it was found in the fishing harbor, from where it colonized the one-kilometer long by 50 meters wide gardens that separate the harbor from the city. These gardens were built at the beginning of the XXth century, but the lizards were not discovered there until 1957. The lizards disappeared from the harbor when it was rebuilt and the same happened with the population from the gardens when small walls were built to separate the main paths from the cultivated areas, difficulting the escape of the animals in case of danger. This was between 1963-1964. According to Pleguezuelos (2004), the population is now expanding again.

Another population of *P. sicula* was reported from Noja (Cantabria) by Meijide (1981). However, the presence of this species in Cantabria was known since 1963, when Valverde saw a jar with specimens from Santander (without recording the collector) at the Museo Nacional de Ciencias Naturales, Madrid (Valverde, 2005). As a result of that, Valverde asked Manuel Meijide to search for *P. sicula* in the Santander area (M. Meijide, pers. com.), indicating that the preserved specimens may come from the Jardines de Piquio (in Santander's harbor). However, the lizards were not found in the harbor but in Noja (Meijide, 1981). In that place, the lizards inhabit a sand dune area, hardly colonizing any walls from the nearby buildings, which are inhabited by *Podarcis muralis* (pers. observ.). Recent data suggest that the Cantabrian populations of *P. sicula* are decreasing in number (Pleguezuelos, 2004; our own data). Although the exact origin of these populations is unknown, it has been hypothesized that these could have been introduced with equipment for the Italian troops during the Spanish Civil War (1936-1939) (Rivera & Arribas, 1993).

*Podarcis sicula* is very abundant in Menorca, where the southern Italian morph ("sicula" type) is present. From Menorca, this introduced lizard has colonized the satellite islands of Llatzaret, Illa Plana and Ses Mones (Pérez-Mellado, 2009; Rivera et al. 2011). This lizard has also been introduced in the Colonia Sant Jordi, Southern Mallorca (northern morph, "campestris" type) (Zawadzki & Seeman, 2009).

*Podarcis sicula* has also been recently introduced in Lisboa, Portugal (González de la Vega *et al.*, 2001).

### **PODARCIS SICULA IN CATALONIA**

On the 1<sup>st</sup> of April 2011, during an herpetological prospection in Sant Celoni (Vallès Oriental, Barcelona), some individuals of *P. sicula* were observed in an area with 11 large olive trees (*Olea europaea*), 10 of them growing in the outer limits of a garden center. The trees were between 11 and 13 m high, with a perimeter greater than 3,5 meters. Searching among these trees, the presence of some specimens of *Podarcis liolepis*, two young *Timon lepidus* as well as three adult specimens of *Podarcis sicula* (one male and two females) was detected. Two of them were photographed and one of the specimens autotomized its tail after some unsuccessful tentatives of capture. This autotomized tail was preserved for genetic analysis. After morphological examination, the specimens could be confidently assigned to the Italian meridional morphotype (“sicula” type, reticulated and present in Sicily, Sardinia, southern Italy, Menorca and Dubrovnik). The results of the molecular analyses (sequencing of 330 base pairs of the 12S rRNA mitochondrial gene followed by a blast search in GenBank) also supported that the introduced specimen analyzed belongs to the “sicula” type. In fact, the 12s rRNA mitochondrial fragment from the specimen analyzed in the present study is identical to the 12S rRNA of the two specimens introduced in La Rioja sequenced by Valdeón *et al.* (2010) (GenBank Accession numbers: HM746961-HM746962) and assigned to the subspecies *sicula-cetti-ragusae*. This suggests a similar area of origin for the two introduced populations. The interior of the garden center was visited on the same day in order to search for reptiles around the many other large olive trees that were on sale. The search detected the presence of one sub-adult of *Timon lepidus*, several *Podarcis liolepis*, *Tarentola mauritanica* and an adult male of *Podarcis sicula*. On the 8<sup>th</sup> of April 2011 a second prospection was carried out, in which six adults of *P. sicula* were observed in the olive trees growing in the outer limits of the garden center. When we enquired about the origin of these trees to the workers of the garden center, they informed us that the trees growing in the outer parts of the garden came from Calabria, Southern Italy, while the trees inside the garden center were all from Extremadura (Western Spain), with the only exception of one tree imported from Calabria. The relatively low number of specimens observed (six in the last visit) together with the fact that all were adults and that all were restricted to the olive trees, makes us believe that the introduced *P. sicula* are still not well established. If one takes into account that a minimum of six adult *P. sicula* arrived with a maximum of 11 olive trees, it realizes that the probabilities of introduction with imported trees are pretty high (Valdeón *et al.* 2010). Another interesting point is that near these olive trees, and even living inside them, there were autochthonous reptile species like for instance *Podarcis liolepis*, *Timon lepidus* and *Tarentola mauritanica*, some of which (*Timon lepidus* and *Tarentola mauritanica*) may have arrived from Extremadura together with the olive trees. This situation of autochthonous and introduced fauna all

living associated to commercial olive trees opens the possibility to further introductions of these reptiles into places where the trees are sold.

The case presented here is very similar to other reported introductions of *P. sicula* mediated by olive trees that happened in La Rioja (Northern Spain), Northern Italy (lizards of meridional origin) and Hyères (Southern France) (Bruekers, 2003, 2006; Valdeón et al. 2010). In conclusion, it would be interesting to know if the same kind of introductions is happening across the many garden centers present in the Mediterranean area, from where trees can be transported between different places within the Mediterranean, like in the present example, or overseas. Also, introduction of snakes (*Malpolon*, *Rhinechis* and *Hemorrhois*) into the Balearic islands inside olive trees has been documented (Alvarez et al., 2010).

The presence of introduced *P. sicula* in the garden center was reported to the competent authorities of the Catalan Government (Departament de Medi Ambient, Generalitat de Catalunya), which are studying the possibility of eradicating them.

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**Fig. 1:** *Podarcis sicula* (male), photographed in a garden center in Sant Celoni. Photo: X. Rivera



**Fig. 2:** *Podarcis sicula* (female), photographed in a garden center in Sant Celoni. Photo: J.Maluquer



**Fig. 3:** Italian olive trees imported to Sant Celoni (Catalonia). Photo: Xavier Rivera



**Fig. 4 (upper) & Fig. 5 (bottom):** Bottom and Upper photo, olive trees imported to Sant Celoni's garden center (Catalunya), originating from Extremadura (South eastern Spain), in which it is possible to see (enlarged photo at the bottom) one *Timon lepidus* (about three observed at the same place) of unknown origin. Some individuals of *Tarentola mauritanica* have been seen on the same tree, and it is possible that some of them come from Italy or South Spain. Genetic samples should be analyzed in order to confirm these hypothetical introductions.