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New case of fruit eating observation in *Podarcis siculus* (Rafinesque-Schmaltz, 1810) (Lacertidae) from Croatia

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Abstract. The switch to frugivory in some members of the family Lacertidae is expected to be adaptations for island life, where commonly used prey sources are limited. Herein we reported upon our observation a new case of frugivory in *Podarcis siculus* from Istria, Croatia. During several excursions to Veruda Island near Pula we repeatedly photographed and observed feeding of these lizards on fruit remains and fresh fruits. Lizards tried to nibble and lick juice or took and swallow fleshy pieces from the fruits. The behavior was independent on season and was observed at both the rocky coast with a sparse vegetation cover as well as in grassy habitats in the center of the island.

Key words: *Podarcis siculus*, Italian wall lizard, frugivory, island, Balkan Peninsula.

Animals on islands are forced to adapt to their living space (Losos & Ricklefs 2009), including their diet. For island populations of amphibians and reptiles, the potential low or temporal food availability is compensated by adopting rare or uncommon practices in trophic ecology such as cannibalism, ovophagy, marine prey or ingestion of plant matters (e.g. Pérez-Mellando & Corti 1993, Valido & Nogales 1994, Castilla et al. 2009, Vlček et al. 2013, Brock et al. 2014). Dietary expansion may allow for better colonizing of the new territories (Van Damme 1999), or reduced interspecific competition and predation (cf. Cooper & Vitt 2002 and literature therein). While lizards are usually carnivorous, herbivory and frugivory are often adaptations to island life (cf. Espinoza et al. 2004), and are rarely observed on the mainland (Van Damme 1999, Herrel et al. 2004). Plant matter such as vegetable fiber, flowers, pollen, nectar, seeds, phloem sap or fruit pulp and its juices are typical expanded dietary food items on islands (Pérez-Mellando & Corti 1993, Passos et al. 2013, Teixeira et al. 2013, Brock et al. 2014, Taylor & Gardner 2014).

The genus *Podarcis,* occurring in the Mediterranean region, includes around 21 species from family Lacertidae (Arnold & Ovenden 2002). In several cases, herbivory or frugivory was recorded at the genus on this territory (e.g. Van Damme 1999, Pérez-Mellando & Corti 1993, Zuffi & Giannelli 2013, Brock et al. 2014). The Italian wall lizard, *Podarcis siculus* (Rafinesque-Schmaltz, 1810), is widespread in the Apennine Peninsula, Corsica, Sardinia and Dalmatia (Gasc et al. 1997, Arnold & Ovenden 2002). As a result of human activity, the species was imported to France, Spain, Portugal, Turkey and the USA (Crnobrnja-Isailović et al. 2008). Its feeding ecology has been relatively extensively studied (cf. Zuffi & Giannelli 2013 and literature therein). Their diet mainly consists of insect, spiders, terrestrial crustaceans and gastropods. Herbivory has been recorded, mainly in islands populations (e.g. Pérez-Mellado & Corti 1993, Arnold & Ovenden 2002, Carretero 2004).

In this short report we bring a new case of fruit eating observation of *P. siculus*. During yearly excursions to Veruda Island (Istria Peninsula, Croatia) we several times recorded uncommonly seen feeding behavior. In early September 2008, frugivory was observed in two adult specimens of *P. siculus*.

The site of observation was located on the rocky coast on the south-western part of island (44.82722°N, 13.83916°E; UTM 50×50 km 33TVK1) and represents a typical Mediterranean island coastal habitat on limestone platforms and rocks with scattered xerothermic vegetation in cracks and slits.

First time, we recorded lizards feeding on different fruit remains around trash at about 13:00 h (local time). After this observation, we used fresh fruits for testing interest of these animals, namely peach (Fig. 1A) and grapes (Fig. 1B) were used as bait, which we put in distance of about 2 – 3 m from lizards. Two individuals started to eat fruits after a few minutes of typical "active foraging" behavior. Lizards seemed to be attracted visually from larger distance, and when coming closer to the fruits, they started to flick their tongue in shorter period, which indicates also reception of chemical cues. In a few cases they took pieces of fruit matter away from the site, but most of time they ate fruit on the spot.

Originally we expected frugivory in *P. siculus* during late, dry summer to be an adjustment to low prey availability, which is typical for that season in the Mediterranean. However, in June 2012 and 2013 we observed several other individuals of *P. siculus* feeding on leftovers of different kinds of fruits (nectarines, plums and figs were identified). Two females feeding on overripe mirabelle plums were also observed almost in the center of the island. Two fruits were slightly smashed by falling from the tree and partly eaten by wasps, thus the flesh was visible. It is possible, that the lizards were originally attracted by flies licking the nectar on the fruit surface, but finally they did not catch any insect and started to take and swallow the pulp. In late spring the arthropods (namely locusts, spiders and flies) seemed to be still abundant throughout the area, especially in the grassy habitats among the pines and maquia, which covers most of the island with exception of the water spray zone on the sea shore. Thus, plant food sources are apparently utilized by this population of Italian wall lizard even in times, when a plenty of preferred food items are available. Our findings are in agreement with data from another Adriatic island "Pod

Figure 1. Two observed specimens of *Podarcis siculus* eating peach (A) and grapes (B).

Mrčaru" published by Herrel et al. (2008), who reported consumption of plant matter by *P. siculus* throughout its seasonal activity. Through, significant seasonal increase in the ratio of plant matter in the diet was recorded in the study for relatively recently introduced population at "Pod Mrčaru" island, where the other food availability was low; in spring the amount of plant matter in material digested was 34%, while in the summer it reached 61% of dietary volume. Similarly, Valido & Nogales (1994) reported fruit eating in *Gallotia galloti* (Lacertidae) from the Canary Islands, and Passos et al. (2013) observed such feeding habit in *Ameivula ocellifera* (Teiidae) at coastal areas of Northeastern Brazil. Fruit pulp and its juices (which are rich in sugar) provide high energetic sources of nutrients during warm days or on poor trophic and dry localities such as xeric islands (Pérez-Mellado & Corti 1993, Valido & Nogales 1994, Passos et al. 2013, Brock et al. 2014).

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