Interactions between lizards *(Podarcis hispanica atrata)* and scorpions *(Buthus occitanus)* in the Columbretes Islands

Aurora M. CASTILLA

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This study reports some observations on the predation of lizards (*Podarcis hispanica atrata*) by scorpions (*Buthus occitanus*), as well as on the predation of scorpions by this lizard species in the Columbretes islands (Castellón, Spain).
***Keywords**: Mediterranean islands, lizard, scorpion, predation.*

INTERACCIONS ENTRE SARGANTANES (*Podarcis hispanica atrata*) I ESCORPINS (*Buthus occitanus*) A LES ILLES COLUMBRETS.
En aquest estudi es descriuen algunes observacions sobre depredació de sargantanes (*Podarcis hispanica atrata*) per escorpins (*Buthus occitanus*), així com sobre depredació de escorpins per aquesta espècie de lacèrtid a les illes Columbrets (Castelló, Espanya).
***Paraules clau**: Illes Mediterrànies, lacèrtids, escorpins, depredació.*

Aurora M. CASTILLA, Department of Biology, University of Antwerp (UIA), B-2610 Wilrijk, Belgium, and Institut d'Estudis Avançats de les Illes Balears (CSIC), Km 7.5, Ctra. Valldemossa, E-07071 Palma de Mallorca, Spain. Internet: CASTILLA@uia.ac.be

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Introduction

Several North American and African scorpions of the families Scorpionidae and Buthidae, are predators of some species of geckos (*Coleonyx, Pachydactylus, Palmatogecko*) and lizards (*Mabuya, Urosaurus, Dipsosaurus, Sceloporus, Uta, Cnemidophorus*). Lizards and other small vertebrates may constitute an important part of the scorpion diet in xeric areas where

insect prey are scarce (see review in McCormick & Polis, 1982). Laboratory studies have demonstrated that scorpions are able to successfully capture, handle and digest lizards (Hardy, 1947; Banta, 1957).

Predation of reptiles by scorpions has, to my knowledge, not yet been described for European species.

Material and methods

Observations were conducted during 1991-1993 in the island 'Columbrete Grande', the biggest (13 ha) and the only inhabited one from the archipelago. The Columbretes islands (39° 54'N, 0° 41'E) are an archipelago of small islets of volcanic origin located in the Mediterranean, ca. 50 km off the coast of Castelló (Spain). See Castilla & Bauwens (1991a; 1991b), for a detailed description of the study area.

Results and discussion

I accidentally observed predation of hatchling lizards by scorpions. In August 1992 at about 23:00 hours, a large scorpion was seen transporting a small lizard on its back (A. Sánchez, pers. comm.). In July 1993, at 17:30 hours, an adult scorpion attacked a hatchling (29.8 mm snout-vent length and 0.5 g mass). The juvenile was kept in an outdoor terrarium (100x20x50 cm) filled with sand, plants, cover, food and water. The scorpion accidentally entered in the terrarium without being previously detected by the observer. The scorpion which was hidden under plants, suddenly injected his pincher into the abdo-

Fig. 1. Scorpion *(Buthus occitanus)* preying upon hatchling lizard, *Podarcis h. atrata.*
Fig. 1. Escorpió (Buthus occitanus) *atacant sobre una jove sargantana,* Podarcis h. atrata.

men of the lizard and held its body and head with its pincers during few minutes until the juvenile was paralysed by the venom. Afterwards, the scorpion released the lizard, handled it and put it on its back to be transported to cover. Immediately afterwards, the scorpion broke and subdued the lizard's tail (Fig. 1).

I have never seen scorpions eating adult lizards, even though they share retreats under rocks during late afternoon and night.

While the venom of large scorpions is seemingly strong enough to kill a juvenile lizard, it does not have the same effect on adults of 8 to 10 g body mass (four observations). Nevertheless, the venom seems to cause some inconveniences. Immediately after a sting, adult lizards lick (or try to), their body part where the scorpion's chela was introduced. When lizards were stung into the hindlegs, the poison slightly and temporarily immobilised the legs (two observations). However, scorpion stings do not kill adult lizards.

Podarcis h. atrata occasionally predates on scorpions. Both, the analysis of stomach contents (Castilla *et al.*, 1987) and the examination of faecal pellets (Castilla, unpubl.), revealed the presence of scorpion remnants. Furthermore, occasional predation of scorpions by lizards has been directly observed (own obs. and guardians pers. com). I only observed adult lizards (males and females) eating both juveniles and adult scorpions. When living scorpions were tethered to a nylon thread, and presented to adult lizards in the field, different reactions were observed. Some lizards attacked the scorpions, some ate them and some ignored them, while other lizards fled from the scorpion. Thus, at least some lizards predate on scorpions.

My observations indicate that each species functions as predator and prey of the other species. Interactions between a vertebrate (lizard) and an invertebrate (scorpion) provide an example of 'cross predation', that is, vertebrates are simultaneously the prey and the predator of the same species of invertebrate (McCormick & Polis, 1982). Such 'cross predation' between species has been reported by other authors (see refs. in McCormick & Polis, 1982). Cross predation is believed to be an important factor in determining the structure of aquatic communities (see ref. in McCormick & Polis, 1982). However, there is less evidence for the occurrence of cross predation in terrestrial environments (McCormick & Polis, 1982).

More thorough analyses of the trophic interactions between scorpions and lizards are necessary to fully understand their role in the population dynamics of both species.

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