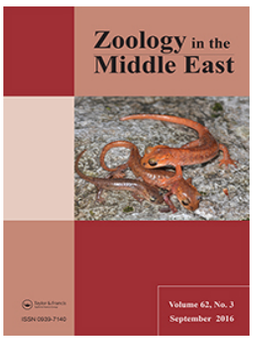

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Diet of the Worm Lizard, *Diplometopon zarudnyi* (Nikolsky, 1907), in Riyadh province, Saudi Arabia (Reptilia: Trogonophidae)

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We analysed the diet composition of 133 specimens of the Worm Lizard, *Diplometopon zarudnyi*, in Riyadh province, Saudi Arabia. Analysis of stomach contents revealed that 90 specimens (66.6%) had prey items in their gut. The stomach content consisted mainly of small invertebrate prey (beetles), mainly larvae of *Dermestes* sp., but also imagines of *Dermestes maculatus* and *Rhynchophorus ferrugineus*. *Dermestes* sp. constitutes over 99% of the total food items, showing a high selectivity in food intake. The high number of beetles in the stomach contents indicates that this lizard forages very frequently. Specimens collected during winter had empty stomachs. The high proportion of fossorial prey items and the occasional records of other stomach contents show that *D. zarudnyi* only occasionally forages on the surface.

Keywords: Feeding; worm lizards; Coleoptera; beetles; fossorial

Introduction

Amphisbaenians show many morphological adaptations to the fossorial lifestyle, such as vestigial eyes, loss of limbs, fused cephalic shields, a compact skull, elongated body and a trunk with a similar diameter in all its extension (Gans, 1978; Navas et al., 2004). Most amphisbaenian species seem generalists with respect to their feeding habits (Bernardo-Silva et al. 2006; Gomes et al., 2009; Balestrin & Cappellari, 2011; Martín, López, & García,2013), although the narrow diets of some specialist species suggest that they may be more selective (Webb et al., 2000; Vega, 2001). These reports reveal that the amphisbaenian diet consists mainly of small arthropods found in the soil, such as ants, termites, beetles, or spiders. However, most of these studies did not evaluate the availability of prey in the environment. There is not much information available on specific diets and preferences of amphisbaenians in the Palaearctic region, except for *Blanus cinereus* from the Iberian Peninsula (Lopez & Salvador, 1992; Lopez & Martin, 1994). In natural habitats, the composition of stomach contents can differ from what is available in the soil (Lopez, Martín, & Salvador, 1991), indicating that amphisbaenians can discriminate and select different types of prey. In fact, amphisbaenians might be using chemosensory cues to identify preferred prey (Lopez & Salvador, 1992; Semhan et al., 2010).

To understand the feeding ecology of amphisbaenians and to assess whether these animals are selective and specific in their diet preference or whether they consume prey according to relative abundance, we need more studies that compare the diet of amphisbaenians with the availability of potential prey in their underground habitat. The Amphisbaenian *Diplometopon zarudnyi* represents the single species of the family

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Trogonophidae in central Arabia (Al-Sadoon, 1988) and is widespread in arid habitats in western Iran, southern Iraq, Kuwait, Oman, and northern Saudi Arabia (Gans, 1978). It inhabits Aeolian sand deposits and emerges on to the surface to breed (Maisano, Kearney, & Rowe, 2006), but there is little detailed information on the ecology of the species. The aim of this study was to report prey types and frequency in the diet of *D. zarudnyi* and to make inferences on the feeding behaviour of the species collected in different seasons of the year.

Material and Methods

We analysed 133 adult specimens of *D. zarudnyi* for the composition of their stomach contents, collected between November 2004 and October 2005 from different locations in the Riyadh region, Saudi Arabia (24°38′N, 46°43′E) and by means of monthly field trips during which notable traces left on the soil surface were searched for. The animals were collected during December-February (winter), March-May (spring), June-August (summer) and September-November (autumn). In summer collections were carried out after sunset because in this season amphisbaenians are buried deep in the ground due to the high temperature and are very hard to find in day time. When the temperature dropped, amphisbaenians were searched for by lifting stones. They were abundant and easy to find under stones. The captured specimens were transported to the Zoology Department, College of Science, King Saud University, where they were kept for less than an hour until they were frozen at -2°C for 24 h pending further analysis. All animals were euthanized in accordance with the standards set forth in the guidelines for the care and use of experimental animals by the King Saud University, Riyadh, Kingdom of Saudi Arabia.

A mid-ventral incision was made to determine the presence/absence of food items in the stomach contents and all intact or partially digested prey items were removed for further examination. Carcasses were fixed in 10% formalin within 3 h of capture and stored in sealed glass vials containing 70% ethanol. Stomachs were removed and stored separately in vials with 70% ethanol. Stomach contents were analysed under a Leica Zoom 2000 stereomicroscope. Only items found in the stomachs were considered because these were the least digested and easiest to identify.

We evaluated whether there were differences in the number of prey items and in the mean volume of the largest prey consumed per worm-lizard between seasons using One-Way Analysis of Variance (ANOVA).

Results

A total of 133 specimens of *D. zarudnyi* was analysed, 90 (66.6%) of which showed stomach contents. The stomach contents contained exclusively *Dermestes* sp. and *Rhynchophorus ferrugineus*, and the rest were unidentified indigestible plant materials and sand. Unidentified beetle larvae of the genus *Dermestes* sp. and their chitinous parts constitute 96.9% of the diet. This was followed by larvae of the Asian Palm Weevil (*Rhynchophorus ferrugineus*) accounting for 2.06% and the scavenger beetle (*Dermestes maculatus*) which formed 1.03% of the total prey items in spring season (Table 1).

When feeding is compared in terms of different seasons, it was observed that Worm Lizards had empty stomachs during the winter months (December–February). Our data indicate that beetle larvae of the genus *Dermestes* found in the diet of *D. zarudnyi* constitute 0.94 g (31.8%), 0.92 g (31.1%) and 1.09 g (36.9%) of the total volume of food items during the spring, summer and autumn months respectively. Similarly, Palm Weevil larvae and *D. maculatus* formed a very small percentage of the total content of the stomach of these lizards, reaching 0.02 g and 0.01 g respectively during the months of spring, and these food items were missing in other seasons of the year (Table 1).

Table 1. Seasonal composition of the diet of the Worm Lizard, *D. zarudnyi*, based on 133 stomach contents. Winter = December to February, spring = March to May, summer = June to August, autumn = September to November.

	Larvae of *Dermestes* sp.		***R. ferrugineus***		***D. maculatus***		**Total weight**	**Percentage**
	g (%)	**%**	**g (%)**	**%**	**g (%)**	**%**	**g**	
Winter	–	–	–	–	–	–	–	
Spring	0.94 (31.8)	96.9	0.02 (100)	2.06	0.01 (100)	1.03	0.97	100
Summer	0.92 (31.1)	100	–	–	–	–	0.92	100
Autumn	1.09 (36.9)	100	–	–	–	–	1.09	100
Total	**2.95 (100)**		**0.02 (100)**		**0.01 (100)**			

Discussion

The stomach contents examined in the present study demonstrated the selectivity in food intake of *D. zarudnyi*, which agrees with published reports on the diet of another worm lizard, *Amphisbaena alba* (Colli & Zamboni, 1999). Most prey items were beetle larvae, which are abundant in the Riyadh province of Saudi Arabia. Termites and ants were found to be the main prey types of other species of amphisbaenians worldwide (e.g. *Bipes biporus*, Kearney, 2003) suggesting that this kind of prey can be preferable for these fossorial reptiles. Since worm lizards are limbless and have vestigial eyes, their primary source of food is insect larvae, which are slow-moving prey and are easy to capture, as reported by Al-Sadoon, Al-Johany, and Al-Farraj (1999) in the Sand Fish Lizard, *Scincus mitranus,* which relies on worms, ants and small insects which are mostly slow-moving prey items.

The presence of the beetle *D. maculatus* can be considered as an accidental case in the feeding process of *D. zarudnyi* since these insects are fast-moving. Larvae of the Palm Weevil *R. ferrugineus* were found in the stomachs of worm lizards collected from Al-Kharj farms, a place where many palm trees are found.

The predominance of fossorial prey items and the occasional record of nomadic insects indicate that *D. zarudnyi* feeds usually underground but is also able to forage on the surface. Moving their viscous tongue outside the mouth while searching for food may lead to the adhesion of sand grains. The presence of the remains of indigested plant materials in the stomach of these lizards does not necessarily suggest that these lizards rely on plants in their feeding process: Vega (2001) and Al-Sadoon (1999) suggested that the uptake of these plant materials is through larvae which feed on plants. We consider it to be a result of accidental ingestion during prey capture by the lizards, which agrees with the findings of Maia et al. (2011) in *Ecpleopus gaudichaudii*.

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Disclosure Statement

No potential conflict of interest was reported by the authors.

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