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Comparative diet of northern and southern Tunisian populations of *Chalcides ocellatus* (Forskal, 1775)

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Abstract: We conducted a comparative analysis of diet in different populations of *Chalcides ocellatus* from northern and southern Tunisia. Our main objective is the description of the diet of this species in two contrasting environments in Tunisia. By comparing these two environments, we attempt to uncover possible differences in feeding behaviour in this species. The analysis concerned 105 individuals, 70 from the north and 35 from the south. The most consumed prey by northern lizards were Coleoptera and larvae, while isopods and larvae were more ingested by the southern ones. The prey consumed by the southern lizards were more diversified than those consumed by the northern ones. *Ch. ocellatus* is a generalist lizard which has various strategies of feeding in the different areas. In the north, females consume larger and less numerous prey than males. In the south, females feed on shorter and less numerous prey than males. Southern lizards also differ in the diversity of their diet.

Key words: *Chalcides ocellatus*, diet, Scincidae, resource partitioning, Tunisia.

Resumen: Dieta comparada de las poblaciones de *Chalcides ocellatus* (Forskal, 1775) del norte y del sur de Túnez. – Realizamos un análisis comparativo de la dieta en distintas poblaciones de *Chalcides ocellatus* del norte y del sur de Túnez. Nuestro objetivo fundamental es describir la dieta de esta especie en dos ambientes diferentes en Túnez. Al comparar estos dos ambientes intentamos poner de manifiesto posibles variaciones en el comportamiento trófico de esta especie. El análisis incluyó 105 individuos, 70 del norte y 35 del sur. Los tipos de presa más consumidos por los lagartos del norte fueron Coleoptera y larvas, mientras que los del sur consumieron más isópodos y larvas. Los lagartos del sur consumieron presas más diversas que los del norte. *Ch. ocellatus* es un lagarto generalista con distintas estrategias de alimentación en distintas áreas. En el norte, las hembras consumen presas más grandes y menos numerosas que los machos. En el sur, las hembras ingieren presas más cortas y menos numerosas que los machos. Los lagartos del sur también difieren en cuanto a la diversidad de su dieta.

Palabras clave: *Chalcides ocellatus*, dieta, Scincidae, reparto de recursos, Túnez.

INTRODUCTION

This paper is part of a study of the ecology of the Scincidae in Tunisia. Eight species of Scincidae are found in Tunisia, of which *Chalcides ocellatus* is represented by the subspecies *tiligugu* Gmelin 1788 (MATEO *et al.*, 1995; SCHLEICH *et al.*, 1996). It is a diurnal lizard characterised by pentadactyl members and black ocelli with white centre on the back and the tail. It has 28-34 scale rows around the middle of the body (usually 28-30). Maximum snout-vent length recorded for this subspecies is 170 mm (BOULENGER, 1890, 1920; BONS, 1967).

This subspecies occurs in the extreme north-east of Morocco, Algeria, Tunisia, Sardinia, and Sicily (BOULENGER, 1887, 1890; BONS, 1967; SCHLEICH *et al.*, 1996). In Tunisia, *Ch. ocellatus* has the widest geographical distribution of all the Scincidae, extending from the northernmost part of the country to the northern limits of the Sahara desert in the south, and is also found on the islands of Zembra, Zembretta, Galite, and Galiton (ANONYMOUS, 1881; BOULENGER, 1891; OLIVIER, 1896; LANZA & BRUZZONE, 1959; BLANC, 1988; SMITH *et al.*, 1998). It lives in very humid, but also very arid and dry regions (rainfall from less than 100 mm up to more than 1000 mm/y).

This semi-fossorial species occupies a very wide range of habitats (archaeological sites, cultivated fields, hedges, gardens, open forests, etc.), and can occasionally reach very high densities, mainly in the oases and in some archaeological sites. The diet of *Ch. ocellatus* has not been studied before, at least in North Africa. In the present work we describe the basic pattern of the diet of this species in two different kinds of biotopes in Tunisia, and make comparisons between them.

MATERIALS AND METHODS

The sample used in this study includes 126 specimens collected in two seasons of activity (2001 and 2002) and coming from five areas in the north and the south of Tunisia. The sampled lizards were caught in different periods, in June and July for the northern areas and in August for the southern ones. Comparisons between populations through time cannot be done. We pooled all northern and all southern individuals because they live in very similar biotopes.

The northern stations are located in two archaeological sites. They are characterised by a relative scarcity of plant cover and by an abundance of stones in buildings and on the ground. The first, Bulla Regia, is near the city of Jendouba (36° 34’ N, 08° 39’ E) and has lizards with the largest SVL in our sample (mean SVL = 136.47 ± 8.69 mm). The second site corresponds to the Table of Jugurtha (35° 48’ N, 8° 25’ E), which consists of a rocky tray elevated over the surrounding areas; it is located near the Algerian border and *Ch. ocellatus* are particularly abundant at this site (nearly half of the collected specimens; mean SVL = 82.94 ± 2.20 mm). In these sites the lizards are mainly found under stones, but can also shelter in fissures of walls or below rocky slabs. The rainfall in the northern sites is > 500 mm/y.

The southern stations correspond to oases. The first (two stations) are located near the city of Gabès (33° 53’ N, 10° 04’ E), a coastal city in the south-east of Tunisia (rainfall < 200 mm/y). Lizards at this site have a mean SVL = 81.55 ± 4.25 mm. The second, in the south-west, is located in Degueche village (33° 56’ N, 07° 58’ E) where the rainfall is < 100 mm/y. Lizards at this site have a mean SVL = 78.28 ± 5.00 mm. In the oases, the lizards are found under stones, fallen trunks and palm tree leaves, manure, and packed organic matter in decomposition. In these dry and hot regions (the air temperature may rise up to more than 45°C in summer), *Chalcides ocellatus* is essentially found in the oases, and its presence seems to be related to the presence of water (irrigation) and the different kinds of invertebrates living there and which are part of its diet. During the hot season, the natural plant cover is reduced to shrubs (the herbaceous layer is dry if not absent), particularly in the northern locations. The soil is dry, due to the absence of the plant cover, but also to the heating action of the sun. In the oases, the plant cover is also reduced during the hot season (compared to other seasons), and the soil dries due to the scarcity of water, the action of the sun, but also because some harvested zones are abandoned at this time. These conditions raise the soil temperatures and affect the availability of the soil fauna in both areas.

We measured the snout-vent length (SVL) of each individual with a digital caliper to the nearest 0.01 mm, then proceeded to dissect it. Sex was determined by inspection of the gonads and the stomach contents were analysed under a binocular dissecting scope equipped with a micrometer eyepiece for determination and measurement of prey sizes. Prey were identified to the level of the order for Mollusca and arthropods according to the keys presented by ZAHRADNIK (1988) and GRASSÉ & DOUMENC (1990).

Highly degraded prey (insects) were counted, but were not included in the analyses because they were difficult to identify (only the Coleoptera are easily identified by their wings). Shell fragments and plant remains were not taken into consideration since they can be eaten accidentally with other types of prey. Only complete Mollusca and complete fruits were taken into account.

The specimens whose stomachs were empty (n = 16) or whose stomach contents were not identifiable (n = 5) were excluded from this analysis. This reduced the sample to 105 lizards (57 females, 48 males), distributed as follows: Bulla Regia (9), Table of Jugurtha (61), Nahhal and Kettana (Gabès) (26), and Degueche (9). Seventy lizards were from the north and 35 from the south. For the analyses we reduced the stations of capture to two (north and south) to be able to make comparisons, and because we expected to find the sharpest differences between dry and humid habitats.

Stomach contents were analysed by different complementary methods (LAWLOR, 1979, ROBSON & LAMBERT, 1980; NOUIRA & MOU, 1982; HEULIN, 1986; CARRETERO & LLORENTE, 1993a, b; PIANKA, 1993). The analyses were made separately by site of capture (north and south) for each of the two sexes, then for males and females pooled.

The index of numeric abundance (% N) of each prey category was determined. This method confers the same importance to the different categories of prey having variable energy values. The consumption of social or grouped insects can modify the image of the food spectrum. The index of presence (% P) of the different prey categories (LESCURE, 1971) was calculated. This index corrects the deformation of the calculation of the % N and re-establishes the balance in favour of the most consumed prey, but it gives the same importance to the different ingested prey.

Since the distribution of prey sizes is log-normal, we transformed the prey lengths into their decimal logarithms to assess the relationships between the sizes of the lizards and their prey. The diversity of prey eaten was measured by Brillouin's index (CARRETERO & LLORENTE, 1993a). The trophic niche was analysed by classifying prey in size classes of 1 mm interval. This approach allows us to determine whether there is a relationship between the consumed prey lengths and the size of the predators (BARBAULT, 1981).

RESULTS

Table 1 shows the values of the trophic descriptors for the different categories of prey ingested by *Chalcides ocellatus*, distributed by sex and area. The prey most frequently consumed by northern males are Coleoptera, larvae, and Heteroptera. Northern females consume Coleoptera, larvae, and Myriapoda. For both sexes pooled, we obtained the same results as for the males, but with different proportions. Several categories of prey are represented in the stomach contents by only one individual. The food spectrum of *Ch. ocellatus* from the northern stations seems to be dominated by three categories of prey: Coleoptera, larvae, and Heteroptera. Coleoptera are, by far, the most abundant prey.

TABLE 1. Comparative descriptors of the taxonomical categories of prey consumed by *Ch. ocellatus* in Tunisia. n: total number of prey, % N: numerical abundance, % P: occurrence.

TABLA 1. Descriptores comparativos de las categorias taxonómicas de presas ingeridas por *Ch. ocellatus* en Túnez. n.: número total de presas, % N: abundancia numérica, % P: ocurrencia.

	North									South								
	males (n = 36)			females (n = 34)			total (n = 70)			males (n = 12)			females (n = 23)			total (n = 35)		
Prey taxa	n = 281	% N	% P	n = 229	% N	% P	n = 510	% N	% P	n = 74	% N	% P	n = 66	% N	% P	n = 140	% N	% P
Mollusca	2	0.7	5.6	9	3.9	17.7	11	2.2	11.4	2	2.7	16.7	1	1.5	4.4	3	2.1	8.6
Isopoda	6	2.1	11.1	1	0.4	2.9	7	1.4	7.1	39	52.7	58.3	15	22.7	30.4	54	38.6	40.0
Amphipoda	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	4	5.4	8.3	0	0.0	0.0	4	2.9	2.9
Araneae	10	3.6	22.2	2	0.9	5.9	12	2.4	14.3	7	9.5	16.7	4	6.1	13.0	11	7.9	14.3
Opiliones	3	1.1	5.6	1	0.4	2.9	4	0.8	4.3	0	0.0	0.0	1	1.5	4.4	1	0.7	2.9
Pseudoscorpionida	1	0.4	2.8	4	1.7	8.8	5	1.0	5.7	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Acarina	0	0.0	0.0	3	1.3	8.8	3	0.6	4.3	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Myriapoda	10	3.6	22.2	22	9.6	38.2	32	6.3	30.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Dictyoptera	1	0.4	2.8	0	0.0	0.0	1	0.2	1.4	4	5.4	16.7	1	1.5	4.4	5	3.6	8.6
Blattaria	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	1	1.5	4.4	1	0.7	2.9
Odonata	1	0.4	2.8	3	1.3	5.9	4	0.8	4.3	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Dermaptera	1	0.4	2.8	0	0.0	0.0	1	0.2	1.4	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Orthoptera	4	1.4	8.3	1	0.4	2.9	5	1.0	5.7	0	0.0	0.0	1	1.5	4.4	1	0.7	2.9
Coleoptera	165	58.7	86.1	121	52.8	82.4	286	56.1	84.3	1	1.4	8.3	9	13.6	30.4	10	7.1	22.9
Diptera	1	0.4	2.8	3	1.3	5.9	4	0.8	4.3	0	0.0	0.0	1	1.5	4.4	1	0.7	2.9
Hymenoptera	2	0.7	5.6	3	1.3	8.8	5	1.0	7.1	2	2.7	8.3	0	0.0	0.0	2	1.4	2.9
Homoptera	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	1	1.4	8.3	0	0.0	0.0	1	0.7	2.9
Heteroptera	21	7.5	30.6	18	7.9	20.6	39	7.6	25.7	7	9.5	25.0	5	7.6	17.4	12	8.6	20.0
larvae	40	14.2	50.0	23	10.0	41.2	63	12.4	45.7	6	8.1	25.0	21	31.8	39.1	27	19.3	34.3
unid. insects	11	3.9	25.0	13	5.7	35.3	24	4.7	30.0	1	1.4	8.3	6	9.1	13.0	7	5.0	11.4
lizards	0	0.0	0.0	1	0.4	2.9	1	0.2	1.4	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
shell fragments	1	0.4	2.8	0	0.0	0.0	1	0.2	1.4	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
plant matter	1	0.4	2.8	1	0.4	2.9	2	0.4	2.9	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0

Southern males consume mainly isopods, spiders and Heteroptera. Females consume larvae, isopods, and Coleoptera. For both sexes pooled, the most abundant prey in the stomach contents are isopods, larvae, and Heteroptera. Isopods and larvae are the most abundant prey in the stomach contents of lizards caught in the south.

Regarding the index of occurrence, the most frequent prey in the stomach contents of northern males are Coleoptera, larvae, and Heteroptera. For females, Coleoptera, larvae, and Myriapoda are the most consumed prey. For both sexes pooled, we found the same results as for females. Coleoptera have a higher percentage than other prey categories. For southern populations, the most abundant prey in male stomach contents are isopods, Heteroptera, and larvae, the latter two categories presenting the same percentage. For females, larvae, Coleoptera, and isopods are the most hunted prey. When the two sexes are pooled, isopods, larvae, and Coleoptera are the most frequent prey in the stomach contents of *Ch. ocellatus*.

Figures 1 and 2 show the relationship between lizard (SVL) and prey size for northern and southern populations. There is a statistically significant correlation between prey and predator sizes in both areas. However, if we consider the most abundant prey in the stomach contents of the lizards caught in different stations (for each sex separately and for both sexes), we note that for northern populations, a significant correlation exists between lizard SVL and prey length (log-log) for males (all prey pooled: $r^2 = 0.22$, $p < 0.001$; Coleoptera: $r^2 = 0.25$, $p < 0.001$). The slopes of the regression between these two parameters are 1.80 and 1.78 respectively. For larvae, no significant correlation exists between their log lengths and those of males. For females, a significant correlation exists between the log prey lengths and the log SVL of the lizards ($r^2 = 0.13$, $p < 0.001$), but also between SVL and the lengths of the Coleoptera (log-log) ($r^2 = 0.23$, $p < 0.001$). Slopes of the latter regressions are 1.83 and 1.79, respectively. There is no significant correlation between the log SVL of the females and the log lengths of the consumed larvae.

For the southern populations, a significant correlation exists for males between their log SVL and the log lengths of all consumed prey ($r^2 = 0.63$, $p < 0.001$), but also between log SVL and the log lengths of isopods ($r^2 = 0.7$, $p < 0.001$). The slopes of the regression

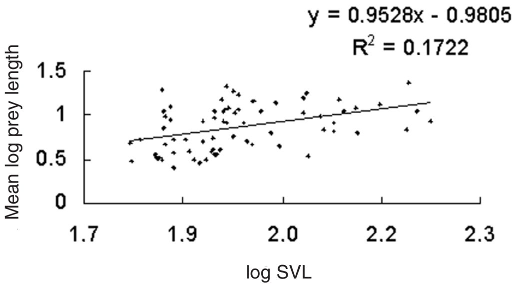

FIGURE 1. Relationship between lizard (SVL) and prey size in *Ch. ocellatus* from northern Tunisia.

FIGURA 1. Relación entre el tamaño de lagarto (SVL) y el tamaño de sus presas en *Ch. ocellatus* del norte de Túnez.

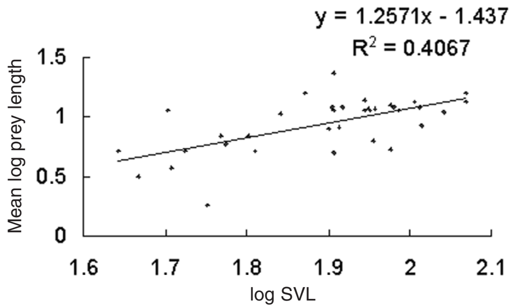

FIGURE 2. Relationship between lizard (SVL) and prey size in *Ch. ocellatus* from southern Tunisia.

FIGURA 2. Relación entre el tamaño de lagarto (SVL) y el tamaño de sus presas en *Ch. ocellatus* del sur de Túnez.

between these two variables are respectively 1.47 and 1.32. For females, a significant correlation exists between the lengths and the SVL (log-log) of the lizards (all prey pooled: $r^2 = 0.15$, $p = 0.002$; Isopoda: $r^2 = 0.66$, $p = 0.0002$). Slopes of these regressions are 1.77 and 1.42, respectively. There is no significant correlation between the SVL of southern females and the length of the larvae they consumed.

The mean length of the log prey eaten by northern males and females are 0.766 ± 0.02 and 0.760 ± 0.02 mm, respectively. The corresponding lengths for southern lizards are 0.879 ± 0.02 and 0.913 ± 0.03 mm. Comparisons of log prey lengths show a significant area factor: southern lizards consume bigger preys than expected for their sizes (ANCOVA: $F_{1,100} = 6.22$, $p < 0.01$).

The total values of Brillouin's index are 2.10, 2.35, and 2.32 for males, females and for both sexes pooled in the north. For the southern populations these values are 2.14, 2.47, and 2.63. Comparisons of individual diversities show clear differences between northern and southern males ($T = 4.23$, $df = 46$, $p = 0.0001$), southern males and females ($T = 3.37$, $df = 33$, $p < 0.001$), and northern and southern females ($T = 8.86$, $df = 55$, $p < 0.001$). Prey diversity for southern males is smaller than that for northern males, but larger than that for southern females. The latter ate less diversified prey than northern females. No statistically significant difference was found between northern males and females. There is a marginally significant difference between northern and southern population diversities ($T = 1.94$, $df = 103$, $p = 0.054$).

The abundance, numerical abundance and index of occurrence of the different prey size classes are presented in Table 2. Figure 3 represents the numerical abundance of the different size classes for both northern and southern populations. The most abundant prey consumed by northern individuals have a length of 2- 4 mm, but they also consume much larger prey (> 20 mm). For southern lizards, the situation is different. The most abundant prey have a length of 3-6 mm, with those in the 11-14 mm range being also very abundant in the stomachs of males. For females, many size classes are well represented in the stomach contents (lengths of 2-5 mm and 10-14 mm, but also other prey between these two length groups). For the whole populations, the most represented size classes in northern and southern populations are 2-4 mm, > 20 mm, and 11-15 mm. Southern lizards tend to consume larger prey than northern ones. We shall note that the longest prey are very thin, so they do not occupy a great volume in the stomachs compared to others having smaller sizes, but occupying more space in the stomachs after being ingested. Between sex and site comparisons of the different size classes show significant differences between areas (ANOVA: $F_{1,1} = 124$, $p < 0.001$), sexes (ANOVA: $F_{1,1} = 5.84$, $p = 0.02$), size classes (ANOVA: $F_{1,20} = 27.69$, $p< 0.001$), and also a significant interaction between size classes and areas (ANOVA: $F_{1,20} = 21.95$, $p < 0.001$).

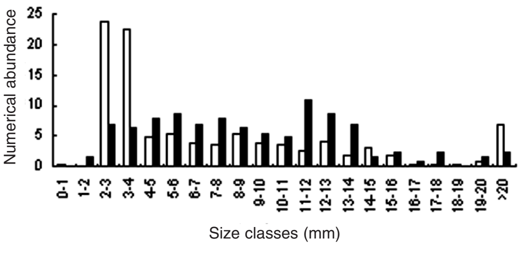

FIGURE 3. Percentage of prey according to the different size classes in the diet of *Ch. ocellatus* from Tunisia. Black bars: southern populations; white bars: northern populations.

FIGURA 3. Porcentaje de presas agrupadas en clases de tamaño en la dieta de *Ch. ocellatus* de Túnez. Barras negras: poblaciones del sur; barras blancas: poblaciones del norte.

TABLE 2. Comparative descriptors of the different size classes of prey consumed by *Ch. ocellatus* in Tunisia. n: total number of prey; % N: numerical abundance; % P: occurrence.

TABLA 2. Descriptores comparativos de las distintas clases de tamaño de las presas ingeridas por *Ch. ocellatus* en Túnez. n.: número total de presas, % N: abundancia numérica, % P: ocurrencia.

	North									South								
	males (n = 36)			females (n = 34)			total (n = 70)			males (n = 12)			females (n = 23)			total (n = 35)		
Size classes	n = 215	% N	% P	n = 171	% N	% P	n = 386	% N	% P	n = 70	% N	% P	n = 58	% N	% P	n = 128	% N	% P
0-1	0	0.0	0.0	1	0.6	2.9	1	0.3	1.4	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
1-2	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	1	1.4	8.3	1	1.7	4.4	2	1.6	5.7
2-3	50	23.3	30.6	42	24.6	35.3	92	23.8	32.9	5	7.1	16.7	4	6.9	13.0	9	7.0	14.3
3-4	52	24.2	44.4	35	20.5	32.4	87	22.5	38.6	6	8.6	25.0	2	3.4	8.7	8	6.3	14.3
4-5	12	5.6	22.2	6	3.5	17.7	18	4.7	20.0	3	4.3	25.0	7	12.1	13.0	10	7.8	17.1
5-6	12	5.6	22.2	9	5.3	20.6	21	5.4	21.4	6	8.6	25.0	5	8.6	17.4	11	8.6	20.0
6-7	8	3.7	22.2	7	4.1	20.6	15	3.9	21.4	7	10.0	41.7	2	3.4	8.7	9	7.0	20.0
7-8	6	2.8	16.7	8	4.7	17.7	14	3.6	17.1	5	7.1	33.3	5	8.6	21.7	10	7.8	25.7
8-9	9	4.2	19.4	12	7.0	23.5	21	5.4	21.4	6	8.6	25.0	2	3.4	8.7	8	6.3	14.3
9-10	8	3.7	16.7	7	4.1	17.7	15	3.9	17.1	5	7.1	25.0	2	3.4	8.7	7	5.5	14.3
10-11	7	3.3	19.4	7	4.1	20.6	14	3.6	20.0	3	4.3	25.0	3	5.2	13.0	6	4.7	17.1
11-12	5	2.3	13.9	5	2.9	14.7	10	2.6	14.3	7	10.0	33.3	7	12.1	26.1	14	10.9	28.6
12-13	9	4.2	19.4	7	4.1	20.6	16	4.1	20.0	7	10.0	41.7	4	6.9	17.4	11	8.6	25.7
13-14	5	2.3	13.9	2	1.2	5.9	7	1.8	10.0	4	5.7	25.0	5	8.6	21.7	9	7.0	22.9
14-15	7	3.3	19.4	5	2.9	14.7	12	3.1	17.1	2	2.9	16.7	0	0.0	0.0	2	1.6	5.7
15-16	3	1.4	8.3	4	2.3	8.8	7	1.8	8.6	1	1.4	8.3	2	3.4	8.7	3	2.3	8.6
16-17	1	0.5	2.8	1	0.6	2.9	2	0.5	2.9	0	0.0	0.0	1	1.7	4.4	1	0.8	2.9
17-18	0	0.0	0.0	2	1.2	5.9	2	0.5	2.9	1	1.4	8.3	2	3.4	8.7	3	2.3	8.6
18-19	1	0.5	2.8	1	0.6	2.9	2	0.5	2.9	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
19-20	2	0.9	5.6	1	0.6	2.9	3	0.8	4.3	1	1.4	8.3	1	1.7	4.4	2	1.6	5.7
> 20	18	8.4	30.6	9	5.3	20.6	27	7.0	25.7	0	0.0	0.0	3	5.2	8.7	3	2.3	5.7

The number of prey consumed by the lizards in our sample is 1-25 for the northern lizards (1-25 for males, 1-17 for females), and 1-15 for the southern ones (1-15 for males, 1-9 for females). The mean numbers of prey by stomach are 7.257 ± 0.586 in the north (7.75 ± 0.842 for males and 6.735 ± 0.817 for females) and 3.971 ± 0.563 in the south (6.083 ± 1.203 for males and 2.870 ± 0.455 for females). The number of ingested preys is thus larger for males than females in the populations of the two studied regions. Comparisons of the number of prey consumed and the SVL of lizards (log-log) showed significant differences between sexes (ANOVA: $F_{1,100} = 3.945$, $p = 0.049$), and areas (ANOVA: $F_{1,100} = 4.927$, $p = 0.028$). Females tend to eat a smaller number of prey than males, mainly in the south.

DISCUSSION

Seven specimens with empty stomachs were caught in northern areas, and nine in the south. They represent 9% and 20% of the total number of sampled individuals at each area. The lizards are thus in a positive energy balance (HUEY *et al.*, 2001). The moderately high frequency of empty stomachs among southern lizards may be related to the relative scarcity of available prey, as prey became scarce by the end of the hot season when the animals were caught.

The northern study sites are very dry and hot in spring and summer, and soil humidity is very low in these seasons. Therefore, the abundance of Coleoptera in the stomach contents of the northern individuals may be explained by their frequency. They are particularly small and therefore eaten in large numbers by the lizards. In the oases, the situation is different. The irrigation of these harvested lands and the presence of organic matter provide enough humid habitats and food for terrestrial isopods and insect larvae which are well represented in the stomachs of the southern lizards. In fact, *Ch. ocellatus* is always hidden in the same biotope where these animals are living. This species is not a widely foraging one; it is rarely seen searching for prey out of its refuge.

The correlation between the SVL of the lizards and prey length is very weak, mainly in the northern populations. This result may be explained by the fact that the available prey in the lizard habitats are not abundant so that these lizards may select the prey they consume in proportion to their length. The longest prey present in the stomachs (myriapods) are not very voluminous. They are not consumed by the largest animals, so their consumption can not be explained by a selective behaviour of the lizards.

The fact that smaller lizards consumed more prey than larger ones is related to the prey dimensions. Indeed, some animals eat a large number of prey with reduced sizes, while others consume a small number of prey having larger sizes. Plant remains have been found only in two stomachs from northern lizards. In one of these we found complete fruits of a Papilionacea, and this excludes the hypothesis of an accidental ingestion. However, the low frequency with which this occurs does not allow us to assert that *Ch. ocellatus* actively looks for plant products to feed.

The lizard found in the stomach contents of one skink consists of the remains of a tail of a *Ch. ocellatus*. This may be due to a case of cannibalism (intraspecific competition), or simply to the fact that this tail was eaten after being lost by another animal. The low frequency of this finding does not permit us to assert that a strong competition exists between these lizards. The site from which they have been extracted has a relatively high density of skinks, compared to other prospected regions in Tunisia.

The large variety of prey taxa, but also the wide range of their relative lengths supports the fact that *Ch. ocellatus* is a generalist lizard. Sex-related differences in feeding are present in the two study areas. In the north, females eat larger prey than males, which in turn consume more prey than females. In the south, females feed on shorter and less numerous prey than males. In northern areas, the individual diversity of prey is the same for both sexes, while in southern ones there is a significant difference in the diversity of the consumed prey. In other words, in northern areas, trophic resources are shared between sexes according to their length, but in southern ones they are not only divided according to their size, but also to their diversity. This may explain the occurrence of the lizards in high densities in some areas, and the success of the species to live in a variety of biotopes and climatic conditions.

The calculated values of Brillouin's index show that the prey consumed by females are more diversified than those eaten by males, for the northern and southern populations. Certain prey categories are eaten only by males, whereas others are eaten only by females, but their numbers are very small (three individuals as a maximum). The ocellated skink has a generalist diet, a characteristic shared with many other Mediterranean lizard species (LÓPEZ-JURADO *et al.*, 1978; NOUIRA, 1983; SAINT GIRONS *et al.*, 1989; CARRETERO & LLORENTE, 1993a, b).

The higher diversity of consumed prey in the south is a consequence of more diversified habitats in this area. The presence of water in the oases and the abundance of organic matter and plant cover create favourable conditions for many invertebrate taxonomic groups living there which can then be consumed by the lizards. The harsh conditions in the northern archaeological sites do not provide such conditions for more diversified prey categories. They contain abundant populations of reptiles because the habitats of the animals are undisturbed (relatively stable), and not very frequented by people who may kill them. In the south, while the oases are very frequented and cultivated, the modes of cultivation (e.g. practically no use of pesticides or machinery), and the abundance of water and organic matter in and on the soil explain the fact that these animals live in these biotopes.

It would be interesting to sample the invertebrates present in the simple northern ecosystems to estimate their diversity and relative abundance, and also to compare them to those found in the stomach contents of *Ch. ocellatus*. For the southern biotopes, a close analysis of the mode of resource partitioning between *Ch. ocellatus* and *Mabuya vittata* will be of great interest, because they are the two most abundant lizard species in the oases, live in sympatry, and are active at the same time (i.e. same temporal niche). However, they have different foraging modes (*M. vittata* is a widely foraging species).

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