SEASONAL VARIATION OF THE DIET OF THE STONE CURLEW *BURHINUS OEDICNEMUS DISTINCTUS* AT THE ISLAND OF LA PALMA, CANARY ISLANDS

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In this study we describe seasonal variation in the diet of the Stone Curlew *Burhinus oedicnemus distinctus* at La Palma, one of the Western Islands of the Canary Archipelago. The study was conducted through faecal analysis. Faeces were collected bimonthly and 266 faeces were examined. The Stone Curlew foraged on 18 main food categories. The diet was clearly dominated by millipedes, which represented the major part of the faeces content in all sampled periods. Beetles were the second most frequently occurring invertebrate group with ground beetles the most dominant among the families present. Grasshoppers and hymenoptera were the other main preys groups consumed by the Stone Curlew. Animal prey such as molluscs and mammals were less frequently found in faeces. The importance of plant material increased sharply between late winter to a peak in the March-April samples. The Stone Curlew has a fairly constant niche breadth, which is suggested by the values of the Levins Index for the different sampling periods. The calculated values of the Pianka Index indicated a very high degree of dietary overlap between periods. Our data confirmed that this species is strictly a surface feeder and that a low intensity farming system may be required to conserve this species.

Keywords: *Burhinus oedicnemus* - diet - Canary Islands - traditional farming

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INTRODUCTION

The Stone Curlew is one of the less studied Palearctic species and it is considered vulnerable at the continental level due to the rapid decline of each different population (Tucker & Heath 1994). Northern and eastern populations are migratory while in the southern part of the breeding range the species is resident (Cramp & Simmons 1983). In the Canary Islands two different subspecies breed, one (*B.o. insularum* Sassi 1908) in the eastern and more arid islands (Lanzarote, Fuerteventura, La Graciosa and Alegranza), the other (*B.o. distinctus*) in the western islands (Tenerife, Gran Canaria, El Hierro and La Palma) where the climate is less extreme (Cramp & Simmons 1983; Hayman *et al.* 1986; Emmerson *et al.* 1994,). The status of these subspecies is uncertain but it could be considered unfavourable due to limited numbers of pairs (less than one thousand, Tucker & Heath 1994) and the present habitat degradation (Martín 1987; Martín *et al.* 1990).

Different studies have discussed the habitat choice and breeding success of this species throughout its distribution range in Western Europe (England: Westwood 1983; Green & Taylor 1995; France: Salamolard *et al.* 1996; Germany: Nipkow 1990; Italy: Meschini & Fraschetti 1989; Spain: Tella *et al.* 1996; Barros & De Juana 1997). All these studies have stressed the importance of maintaining dry grassland, steppes and low intensity practices in cultivated areas. Given the importance of arthropods in Stone Curlew diet, some authors have suggested that the use of pesticides could seriously affect this species (Martín *et al.* 1990; Tucker & Heath 1994). However, information about the feeding habits of this species throughout the year remains scarce, partially because in the northern part of its range the species shows migratory behaviour. Green *et al.* (2000) and Westwood (1983) included, respectively, a quantitative and qualitative analysis of the variation of the diet of the species in different sites in England during the breeding period. Outside the breeding season there is only scattered information about the diet of the species. Amat (1986) analysed 50-60 dried droppings collected in September in Southern Spain. Moreover, for the Canary Islands, Rodríguez & del Campo (1987) analysed thirty-nine faeces collected in October from Gran Canaria where the *distinctus* subspecies lives. Another paper (Sánchez-González 1996), analysing 50 droppings, focused on the spring diet of the *insularum* subspecies in Alegranza, one of the eastern islands of the Canary Archipelago. These papers, and references therein, demonstrated that the Stone Curlew was a surface and mainly nocturnal feeder and was able to collect a wide range of prey, both invertebrates (insects, mostly beetles – Coleoptera, millipedes – Diplopoda, and earthworms – Oligochaeta) and vertebrates (mammals – Mammalia – and reptiles – Reptilia).

In spite of this paucity of data about the diet of the species in the wild, it is worth noting that Green & Tyler (1989) presented a method to study the diet of the species though faecal analysis based on experiment on a captive bird. This study confirmed the validity of faecal analysis over the analysis of regurgitated pellets, because in the latter some important prey types were not represented. The aim of this study is to describe in detail the seasonal variation of a Canarian subspecies of the Stone Curlew diet through faecal analysis.

STUDY AREA AND METHODS

The Canary Islands are situated in the Atlantic Ocean some 100 km (at the closest point) from the African continent. The island of La Palma (28°40'N, 17°50'W) is located in the north-west of the Canary archipelago off W. Africa and it has an area of 728 km^2 and a maximum altitude of 2426 m a.s.l. (Roque de Los Muchachos). The climate is influenced by the wet north-east trade winds, by the high altitude of the island and by the mountain orientation (Afonso 1985). The annual rainfall is 400.9 mm, and the mean annual temperature is 18.3°C (Marzol-Jaén 1984). Mean temperatures range from 15°C in Jan to 22.3°C in Aug and rainfall presents seasonal differences (winter 49.9%, autumn 30.7%, spring 18.7% and summer 0.7%, Marzol-Jaén 1984). The different vegetation belts present in the island are related to the altitudinal variation in temperature and precipitation. Our fieldwork was carried out in the area of El Paso at 750 m a.s.l. In this locality the pine forest is largely replaced by traditional farming activities resulting in a mosaic landscape. Large meadows surrounded by stone-walls are interspersed with areas or edges of natural vegetation composed mainly by Canary Island Pine *Pinus canariensis*, Birdsfoot Trefoil *Lotus hillebrandii*, *Micromeria herpyllomorpha* (Labiatae) and Stapf Thatching Grass *Hyparrhenia hirta*. Cultivated species present in this area were Prickly Pear *Opuntia ficus-barbarica*, Fig *Ficus carica* and Almond *Prunus dulcis*. For detail on vegetation see Santos (1983) and Pérez de Paz *et al.* (1994).

The study was carried out Nov 1997 - Dec 1998. Faeces obtained during the first collection of samples in November 1997 were not analysed because it was not certain when it had been produced. Thereafter we removed all droppings every two months. As the faeces were highly visible on meadows and the birds tended to defecate in determined points of the fields, we can assume that the period of faecal production were accurately determined. A total of 266 faeces (range: 27-56) were collected in seven visits representing the time periods Nov-Dec 1997, Jan-Feb, Mar-Apr, May-Jun, Jul-Aug, Sep-Oct and Nov-Dec 1998. Faeces were preserved in 70% Ethanol prior to analysis. Each faeces was first soaked in water and subsequently examined under a binocular microscope (magnification 20-60x) to detect recognizable fragments (rings for millipedes; chelicera for spiders Arachnidae; bones for mammals; mouth apparatus for beetles, hymenoptera Hymenoptera, true bugs Hemiptera and grasshoppers Orthoptera; legs for beetles and grasshoppers; shell pieces for molluscs Mollusca). Food remains were identified by comparison with reference material. A preliminary analysis showed that several taxa were represented in our samples. We did not try to calculate the number of individual prey items or volumes for each food category, because the level of prey digestibility was species-specific and error connected with biomass evaluation and the counting of the number of preyed individuals for each taxon in each faeces could be large. We preferred to not apply to the data the correction factors obtained with captive birds as proposed by Green & Tyler (1989) and to not estimate seasonal variation in energy intake. A lot of factors (e.g. type of prey, seasonal variation in the diet, birds condition, phenology, age, temperature; McWilliams et al 1999; Caviedes-Vidal 2000; Barlein 2002; Karasov *et al.* 2004,) influenced gastrointestinal system and digestive performance. All these factors are uncontrolled in our study and, as a consequence, we preferred to record only the presence/absence of the different taxa in each faeces making the analysis more conservative.

Results were expressed as percent frequency of occurrence, *F* (frequency (*n*) of occurrence of each food category/number of faeces x 100) and percentage of occurrence, *P* (number of occurrence of each food category/total number of occurrence of all food categories x 100). To calculate the niche breadth for each time period we used the Levins Index of Niche Breadth (Levins 1968, Krebs 1989) which was applied to F. To compare the niche breadth between periods we used the standardized version of this index. The seasonal diet overlap was calculated by means of the Pianka Index (Ricklefs 1980). Differences between the frequencies of occurrence of food categories in the different time periods were tested through Chi-square tests. Only some categories where included according to the minimum acceptable value in expected frequencies (Siegel & Castellan 1989). We used Kruskal-Wallis ANOVA to compare the median number of food categories (i.e. taxa) per faeces across the 7 time periods.

RESULTS

In our study area the Stone Curlew foraged on eighteen main food categories (taking into account the beetles and grasshoppers families, Fig.1). The diet was clearly dominated by millipedes, which almost always represented the major part of the faeces content in all sampled periods. Beetles had the second highest percentage frequency of occurrence across all seven time periods with ground beetles being the most pre-

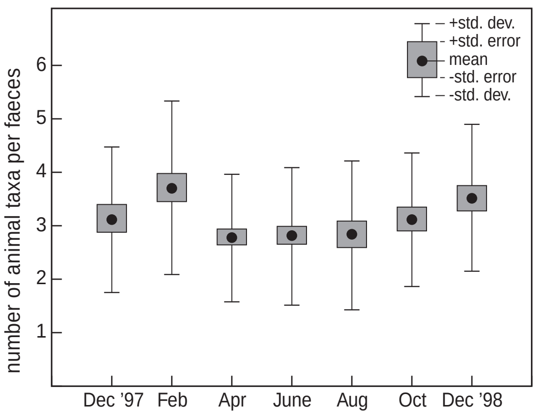

Fig. 1. Seasonal variation in the number of animal taxa per faeces.

dominant of all the families identified. Grasshoppers and hymenoptera were the other main invertebrate groups in the diet of Stone Curlew in La Palma with 25.9% and 38.7% percent frequency of occurrence respectively. Other types of animal prey such as molluscs and mammals occurred less frequently in Stone Curlew diet (Table 1).

Seasonal variation

For beetles, the frequency of occurrence F did not vary significantly between periods ($\chi^2_6 = 11.42$, $P = 0.08$) while the frequency of ground beetle did ($\chi^2_6 = 18.91$, $P = 0.004$), due to low numbers in Jul-Aug and Sep-Oct samples. Darkling beetle (Tenebrionidae), snout beetles (Curculionidae) and scarabs (Scarabeidae) were more frequent in late autumn and winter, the latter being frequent also in Jul-Aug. However, we could not test the significance of these differences between seasons due to low expected frequencies. Water scavenger beetles (Hydrophilidae) were present in about 10% of the faeces from late winter until Jun. The presence of the other beetles families was negligible along the sampled period. Among this order we recognized 67 individuals at aither genus or species level. The most frequent taxon was *Pimelia laevigata* (Tenebrionidae), which represented 28% of the individuals, followed by *Criptophomus schoumi* (Carabidae) at 19% and *Herpisticus eremita* (Curculionidae) with 15%. Other taxa were: *Aphodius* spp. (Scarabeidae) (7%), *Arthrodeis obesus* (Tenebrionidae) (6%), *Opatropis hispida* (Tenebrionidae) (6%), *Chrysolina* spp. (Chrysomelidae) (6%), *Ocypus olens* (Staphylinidae) (4.5%), *Tropinota squalida* (Scarabeidae) (3%), *Hegeter* sp. (Tenebrionidae) (1.5%), *Meloe* sp. (Meloidae) (1.5%) and *Cyminidis discophora* (Carabidae) (1.5%).

The presence of grasshoppers was constant ($\chi^2_6 = 7.17$, $P = 0.30$) reaching a peak in the Sep-Oct sample the presence of this group was more relevant. The presence of the three most common families of the order was confirmed thanks to the few fragments which were identifiable up to the family level. The data suggested that Short-horned grasshoppers (Acrididae) were most frequent in late winter thereafter being substituted by Long-horned Grasshoppers (Tettigoniidae). True bugs, of which we recognized an individual of *Dicranocephalus agilis* (Stenocephalidae), showed two peaks, in late winter and in the Sep-Oct samples. Hymenoptera, molluscs and mammals appeared with low frequency. The latter group, however, could constitute a large part of total prey biomass in autumn. Spiders, which frequently occurred through the autumn and winter seasons, showed a peak in the percent frequency of occurrence in Jan-Feb. These differences across time were highly significant ($\chi^2_6 = 37.24$, $P < 0.001$). The importance of plant material, represented by small remains of leaves and stems with the absence of seeds, increased sharply between late winter and the peak in the Mar-Apr samples. Thereafter these food categories decreased slowly, reaching the minimum value in Nov-Dec. Differences between periods were significant ($\chi^2_6 = 18.35$, $P = 0.005$; Table 1).

Overall, even if the relative importance of the more frequent taxa showed some variation between periods, considering the P value for each prey category the prevalence of millipedes and ground beetles over the less frequent groups is evident. As a consequence, the Stone Curlew at La Palma resulted in having a fairly constant niche breadth, as suggested by the values of the Levins Index for the different periods (Table 2). Moreover the number of food categories eaten by the species during the different periods was similar (Table 2). The values of the standardized version of this Index indicate that this species has a low diet diversification. Taking into account only the animal fraction, the number of different taxa per faeces significantly differed between periods (Kruskal-Wallis ANOVA, $H_{6,266} = 16.07$, $P = 0.013$), because the faeces of Apr, Jun and Aug samples contained less taxa (Fig.1). However, if we also considered the plant material, the number of the different food items per faeces did not differ significantly between periods (Kruskal-Wallis ANOVA, $H_{6,266} = 8.26$, $P = 0.22$). The calculated values of the Pianka Index indicated a very high degree of dietary overlap between periods, espe-

Table 1. Description of the diet of the Stone Curlew. Results were expressed as percent frequency of occurrence, F (number of occurrence of each food category/number of faeces x 100) and percentage of occurrence, P (number of occurrence of each food category/total number of occurrence x 100).

	Overall *n* = 266		Dec 97 *n* = 27		Feb *n* = 35		Apr *n* = 56		Jun *n* = 56		Aug *n* = 30		Oct *n* = 32		Dec 98 *n* = 30	
Prey categories	*F*	*P*	*F*	*P*	*F*	*P*	*F*	*P*	*F*	*P*	*F*	*P*	*F*	*P*	*F*	*P*
Diplopoda																
Millipedes	99.6	28	100	28.7	100	24	100	28.7	100	29.3	96.7	29.3	100	30.5	100	25.9
Coleoptera																
Beetles	87.6		96.3		82.9		83.9		89.3		70		56.2		93.3	
Carabidae	76.7	21.5	96.3	27.6	71.4	17.1	80.4	23	82.1	24.2	63.3	19.2	56.2	17.2	83.3	21.5
Ground beetles																
Curculionidae	12.8	3.6	14.8	4.2	14.3	3.4	8.9	2.5	7.1	2.1	10	3	6.2	1.9	36.7	9.5
Snout beetles																
Scarabeidae	11.6	3.3	11.1	3.2	25.7	6.2	7.1	2	7.1	2.1	13.3	4	3.1	0.9	20	5.2
Scarabs																
Tenebrionidae	10.9	3	14.8	4.2	22.9	5.5	5.4	1.6	8.9	2.6	20	6.2	0	0	10	2.6
Darkling beetles																
Hydrophilidae	7.5	2.1	0	0	11.4	2.7	8.9	2.5	12.5	3.7	6.7	2	0	0	6.7	1.7
Water scavenger beetles																
Chrysomelidae	0.7	0.2	0	0	0	0	0	0	1.8	0.5	0	0	0	0	3.3	0.8
Leaf beetles																
Staphylinidae	0.7	0.2	3.7	1.1	2.9	0.7	0	0	0	0	0	0	0	0	0	0
Rove beetles																
Meloidae	0.4	0.1	0	0	2.8	0.7	0	0	0	0	0	0	0	0	0	0
Blister beetles																
Coleoptera n.i.	5.3		0		5.7		0		1.8		3.3		28		3.3	
Orthoptera	25.9	7.3	18.5	5.4	14.3	3.4	26.8	7.6	28.6	8.4	26.7	8.1	40.6	12.5	23.3	6
Acrididae	3		11.1		5.7		3.6		1.8		0		0		0	
Short-horned grasshoppers																
Tettigoniidae	1.9		0		0		0		3.6		3.3		3.1		3.3	
Long-horned grasshoppers																
Gryllidae	0.4		3.7		0		0		0		0		0		0	
Crickets																
Hemiptera	12	3.4	3.7	1.1	17.1	4.1	7.1	2	7.1	2.1	13.3	4	31.2	9.5	10	2.6
True bugs																
Hymenoptera	2.2	0.6	7.4	2.1	2.9	0.7	0	0	1.8	0.5	3.3	1	0	0	3.3	0.8
Mollusca	0.4	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8
Arachnidae	38.7	10.9	40.7	11.8	80	19.2	32.1	9.2	19.6	5.7	26.7	8.1	43.7	13.3	43.3	11.3
Spiders																
Mammalia	1.5	0.4	0	0	0	0	0	0	1.8	0.5	0	0	3.1	0.9	6.7	1.7
Plant material	54	15.3	37	10.6	51.4	12.3	73.2	20.9	62.5	18.3	50	15.1	43.7	13.3	36.7	9.6

Table 2. Values of the Levins Index (B) and Standardized Levins Index (Bsta) (index of niche breadth).

Period	B	Bsta	*n* categories
December 1997	5.10	0.41	11
February	6.62	0.47	13
April	5.15	0.46	10
June	5.30	0.36	13
August	5.99	0.50	11
October	5.49	0.56	9
December 1998	6.58	0.43	14

Table 3. Values of the Pianka Index for comparisons between periods (index of diet overlap between period).

Period	Dec 1997	Feb	Apr	Jun	Aug	Oct	Dec 1998
Dec 1997	-	0.94	0.96	0.97	0.97	0.92	0.98
Feb		-	0.93	0.90	0.83	0.94	0.95
Apr			-	0.99	0.99	0.94	0.94
Jun				-	0.98	0.94	0.95
Aug					-	0.97	0.97
Oct						-	0.93
Dec1998							-

cially between May-Jun and Jul-Aug samples and between the mid-winter period that was sampled twice (Dec. 1997 and Dec. 1998, Table 3).

DISCUSSION

This study provides the first detailed description of the seasonal variation of the diet of the Stone Curlew, showing that the bulk of its diet was composed mainly of a few food categories, such as millipedes, ground beetles and, to a lesser extent, spiders, grasshoppers and plant material. Our results confirm that Stone Curlew are able to collect a wide range of prey, both invertebrates and vertebrates. The diet of Stone Curlew in our study area was similar to that in Gran Canaria (Rodríguez & del Campo 1987), except for the absence of earwings (Dermaptera). On the other hand, in Alegranza, the diet was less varied with the complete absence of millipedes and ground beetles (Sánchez-González 1996). In both these studies, vertebrates represented an important source of food, especially considering the consumed biomass, whereas in our study area they could be important only in winter. Habitat differences between the western and eastern islands are very marked and might explain these differences. In Spain, outside the breeding period, the most preyed groups were beetles, mostly jewel beetles (Buprestidae), and grasshoppers (Amat 1986). In England, earthworms and, to a lesser extent, isopods (Isopoda) were the main food items (Westwood 1983; Green *et al.* 2000), their relative importance varying between months and habitats (Green *et al.* 2000). The most striking difference between this study and our own was the complete absence of earthworms in our samples. Green *et al.* (2000) demonstrated that the availability of earthworms for the Stone Curlew was strongly affected by the moisture of the soil and they suggested that this fact might account for the absence of this taxon in the diet of the species in more southern countries.

All these data showed that the Stone Curlew was able to capture very different prey and probably used different foraging techniques. However, the complete absence of hypogean fauna, such as larvae and earthworms, from its diet confirmed that the species was strictly surface feeder in our study area as also indicated for England by the behavioural observations reported by Green *et al.* (2000). The presence of coprophilic beetles such as water scavenger beetles, scarabs and rove beetles, suggested that the Stone Curlew searched for food on dung, probably of cows which were common in our study area, confirming the importance of this source of food (Green 1988; Green *et al.* 2000). Plant material constituted an important part of the diet, but only soft parts were consumed. Seed consumption was rarely observed (Cramp & Simmons 1983; Westwood 1983) and it is reasonable to think that the species is unable to efficiently exploit this food resource. Most of the analysed plant fragments were large enough to exclude that they have been ingested within the guts of herbivorous insects preyed by the Stone Curlew; however for a few small ones we could not be sure about the exact source. The Stone Curlew is mainly a crepuscular and nocturnal feeder (Cramp & Simmons 1983; Green *et al.* 2000). In our study area *Pimelia laevigata* and *Arthrodeis obesus* (Tenebrionidae), two of the most frequently preyed on among the beetles species, were active mainly during the night (García *et al.* 1992) causing them to be more exposed to capture by the Stone Curlew.

The differences in the consumption rate of some taxa among seasons could be explained by the variation in their abundance. For example, rove beetles Staphylinidae and blister beetles Meloidae have a very short period in the adult phase (Rafael García pers. comm.) and they are present in the diet in a short period of the year. Moreover, the number of invertebrates present in each ecosystem in the Canary Islands is very variable due to the different climate conditions and vegetation composition. As a consequence, a high degree of variability in the distribution and in the availability of the different prey groups was observed between habitats and even inside the same habitat (García *et al.* 1992). In Canary Islands, seasonality and climate differences between localities are important determinants of variation in abundance of beetles (Campos *et al.* 1986; Fernández-Palacios & de los Santos 1996) and millipedes (Enghoff & Báez 1993). In this archipelago different species and groups are more abundant in spring-summer when rainfall is concentrated (García *et al.* 1992). The diet of Stone Curlew in La Palma and in the other islands of the Archipelago suggests that the Stone Curlew consumed those prey available on the surface in a specific moment or season as suggested also by comparison with the diet of the Chough *Pyrrhocorax pyrrhocorax* in the same area (Pompilio 2003). On the other hand, the most important prey groups (i.e. millipedes and beetle) are very common and abundant species in the Canaries throughout the year and this is reflected in the diet. Although we detected some seasonal patterns in the consumption of different prey items, they were less pronounced in comparison with the common pattern of prey consumption during the year in some sedentary and terrestrial feeding bird species living in the European continent.

Usually, an important shift from an arthropod-based diet in summer toward a plant material-based diet in winter is observed (e.g. Chough: Soler & Soler 1993; Rock Partridge hybrids *Alectoris graeca saxatilis* x *Alectoris rufa rufa*: Didillon 1988). Indeed, the Pianka Overlap Index indicated a very high degree of diet overlap between periods. This was probably caused by the large dominance of millipedes and ground beetles in the diet, which caused the less represented taxa to have only a slight influence on the value of the index. The Levins Index of Niche breadth and its standardized version had very similar values between periods, and the number of consumed taxa was also fairly constant. Only few taxa showed some seasonal variation. There was a decrease of beetles in summer, but this was caused principally by a decrease of the ground beetles, the most important order. For the other orders of beetles no clear patterns were evident. Spiders also decreased in summer, while grasshoppers had a constant presence with a non-significant tendency to decrease towards autumn. Finally, the soft parts of plants presented a very clear pattern, decreasing in late autumn and winter. The climate of La Palma and the other Western Islands of the Canary Archipelago, is fairly constant, especially considering seasonal variation in mean temperature values. Only precipitation is unevenly distributed but the driest period is limited to the summer. As a consequence, only in this period could climate constitute a limiting factor for some groups of insects (Fernández-Palacios & de los Santos 1996;

Gómez 1996). Birds feeding on green parts of plants often select newly grown parts which are more nutritious (Sedinger 1997 and references therein). Taking into account that on La Palma Island, the main precipitation occurs during the autumn-winter period (Santos 1983; Marzol-Jaén 1984), the growing period of plants takes place in spring. This fact causes a shortage of nutrient vegetable matter for the Stone Curlew during winter. Our results about the number of different food items per faeces seemed to indicate that the Stone Curlew compensated for this decrease in animal taxa consumption with an increase in the frequency of consumption of plant material during Spring.

The most important prey group, millipedes, is a very abundant taxon in the arthropod community of the Canary Islands (Báez 1984). Although we were unable to identify prey remains up to the species level, within the Iulidae Family, Portuguese Millipede *Ommatoiulus moreletii* is the most abundant species in La Palma (García pers. comm.) and, as suggested by Rodríguez & del Campo (1987), most of the fragments in the faeces could belong to this species. In the area of El Paso the typical traditional farming landscape of the Western Islands of the Canary Archipelago is mantained and provides a semi-natural habitat suitable for Stone Curlew. These areas, which also offer suitable nesting and roosting areas, support a complex and abundant arthropod community. The Stone Curlew proved to be very sensitive to changes in land-use (Green & Griffiths 1994) especially when dry grassland, steppes and areas cultivated in traditional ways are replaced by intensive cultivations, resulting in the loss of suitable nesting and roosting sites (Tucker & Heath 1994). Structural features of the habitat, such as vegetation height and plant cover, are particularly important factors determining the presence of the species in the different periods of the year (Solis & de Lope 1996, Tella *et al.* 1996). Also in the Canary Islands the introduction of intensive cultivation is considered a threat for the species (Martín *et al.* 1990). Even if the Stone Curlew proved able to breed in intensive arable land, providing arthropod availability was high (Salamolard *et al.* 1996), these kinds of habitats can usually only support a low density of pairs in contrast to semi-natural grassland and sheep pasture (Green *et al.* 2000). Barros *et al.* (1996) and Green *et al.* (2000) suggested that the preference for pasture of the Stone Curlew in the breeding period could be explained by the higher availability of arthropods in that habitat due to higher abundance and improved visibility of prey in short and sparse vegetation. Our data confirm the importance of arthropods in the diet year round and, as suggested also by Martín *et al.* (1990) and Tucker & Heath (1994), we consider that the use of pesticides could result in a negative impact on trophic resources exploited by this species.

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SAMENVATTING

In dit artikel worden de seizoensveranderingen in de prooikeuze van Grielen *Burhinus oedicnemus distinctus* op La Palma (Canarische Eilanden) beschreven. Het voedsel werd onderzocht door uitwerpselen te verzamelen en te doorzoeken op herkenbare voedselresten. Elke twee maanden werd naar uitwerpselen gezocht. In totaal konden 266 keutels worden bekeken. Het voedsel was tamelijk veelvormig, met in totaal 18 verschillende prooicategorieën, maar werd wel het gehele jaar gedomineerd door duizendpoten. Naast duizendpoten bestond het voedsel vooral uit allerlei soorten kevers (vooral loopkevers), sprinkhanen en Hymenoptera. Resten van schelpdieren (Mollusca) en zoogdieren (Mammalia) werden weinig aangetroffen in de uitwerpselen. Plantaardig materiaal nam vanaf het einde van de winter snel in betekenis toe om een hoogtepunt te bereiken in de monsters die in maart en april werden verzameld. De Griel heeft een door het jaar heen vrij constante nichebreedte, althans op grond van de Levins Index. De eveneens berekende Pianka Index liet zien dat er een grote mate van overlap bestond in de prooikeuze van seizoen tot seizoen. De gegevens bevestigen dat deze soort een oogjager is, die zijn voedsel van de grond oppikt. In het artikel worden verder aanbevelingen gedaan om de landbouw zodanig aan te passen dat deze schaarse vogel er zo min mogelijk schade van ondervindt. (CJC)

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