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# Incidence of *Lacerta dugesii* Milne-Edwards, 1829 (Sauria, Lacertidae) in the diet of kestrels (*Falco tinnunculus canariensis* Koenig, 1889; Aves, Falconidae) in a semiarid zone of Madeira

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**ABSTRACT** – This work is intended as a preliminary study on the incidence of the Madeiran lizard *Lacerta dugesii* in the diet of the Kestrel, *Falco tinnunculus canariensis*, an endemic subspecies of Madeira and Canary Islands. A total of 120 pellets of this bird of prey, collected in the easternmost part of Madeira (Caniçal) during July and August of 1993 and 1994, were analysed. The data clearly shows the importance of lizards as a food item in the kestrel's diet.

**T**HE kestrel *Falco tinnunculus canariensis*, is probably the most abundant bird of prey of the Madeira archipelago (Bannerman & Bannerman, 1965; Câmara, 1997), in the Canary Islands (Moreno, 1988). It inhabits almost all kinds of habitats, from sea level to high, mountainous areas. Kestrels are predominantly small-mammal predators in Northern Europe, also feeding on a wide variety of other small prey, including birds, lizards, insects, and earthworms (Village, 1990). In Spain and Portugal its diet largely consists of insects (Valverde, 1967).

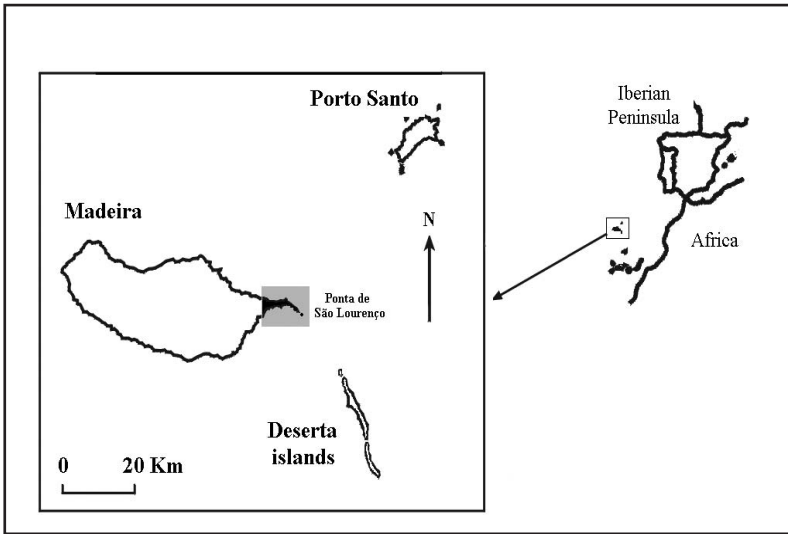
The Madeiran lizard *Lacerta dugesii* is a medium-sized endemic lacertid of the Madeira archipelago. It is a diurnal and heliothermic species that inhabits a great variety of habitats (pers. obs.). Both the lizard and kestrel often coexist in a broad variety of habitats but to date, few attempts have been made to study the trophic ecology of the Madeiran Lizard, particularly its importance as a component in the diet of predators such as the kestrel.

In the Canary Islands, remains of lizards in kestrel pellets have been found (Martin, 1987; Moreno, 1998). In Madeira it has been suggested that the kestrel's diet consists basically of insects and lizards (Bannerman & Bannerman, 1965; Câmara, 1997).

In the present work we have studied the diet composition of the kestrel in the easternmost peninsula of Madeira – Caniçal and Ponta de São Lourenço (Fig. 1), a semiarid zone occupied by a 'stratum herbacium', mainly composed of gramineae. Our aim is to present a preliminary approach to the incidence of *L. dugesii* in the diet of the kestrel.

Pellet analysis is the method most frequently used to assess the diet of kestrels (Village, 1990). The present study was made on 120 pellets collected from a sea cliff, frequently visited by kestrels, located in the easternmost peninsula of Madeira – Ponta de São Lourenço (Fig. 1). The field work was undertaken during July–August of 1993 and 1994. The shape and size of the pellets were not considered since our aim was to provide an assesment of presence/absence of lizards. Pellets were carefully dissected under a binocular microscope.

The hard parts and other indigestible matter were removed and identified, and the 'Index of Relative Presence' (Pilorge, 1981) was calculated as  $I_i = P_i \times 100 / SP_i$ , with  $P_i = n_i \times 100 / N$ , where  $P_i$  is the degree of presence,  $n_i$  the number of pellets containing the items of class  $I$ , and  $N$  is the total number of pellets.



**Figure 1.** Geographic location of the study area (Ponta de São Lourenço) in the East of Madeira Island.

Food items identified in pellets could be grouped into four main categories, as listed in Table 1. Mammals were the predominant prey group, with ‘relative presence’ values of 29% and 30% in the years of 1993 and 1994, respectively. A significant percentage of pellets containing lizards was also found (‘relative presence’ values of 23% and 29%,

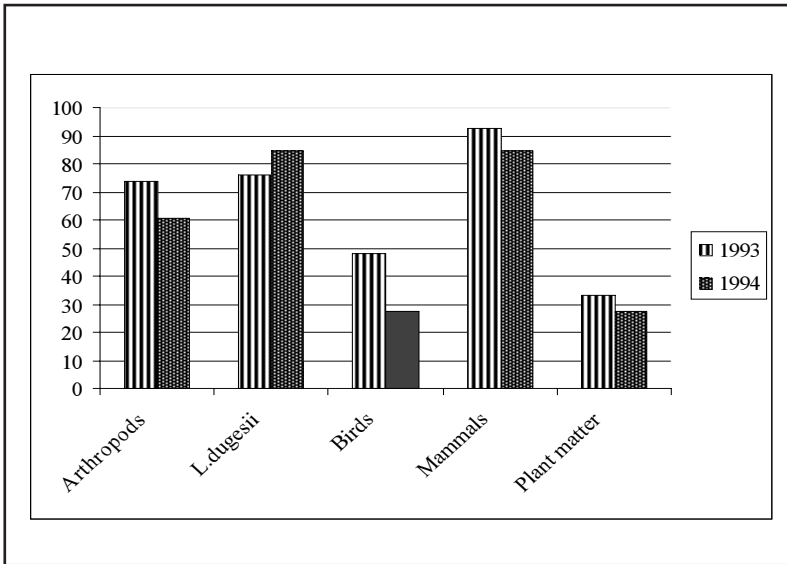
for 1993 and 1994), representing the second most frequent group. Arthropods (23% and 21%) and birds (15% and 10%) also occur in the diet with lower percentages. Plant matter remains in pellets had similar values to that of birds (Fig. 2).

Ecological studies based on the knowledge of trophic relationships of natural vertebrate populations, becomes an issue of some importance, as they provide fundamental data in evaluating conservation programs.

Kestrels may select each prey species according to its abundance. Regional studies on the variation in kestrel diets in European countries have shown that diets reflect the available prey. The proportion of lizards among vertebrate prey increases further south in Europe, a correlation due to the great abundance of lizards in warm and dry climates of southern Europe (Village, 1990).

**Table 1.** The main groups of food items identified in pellets of *Falco tinnunculus canariensis*.

Food item	Nº of pellets containing the food item ( $n_i$ )	Degree of Presence ( $P_i$ )	Index of Relative Presence ( $I_i$ )	Nº of pellets containing the food item ( $n_i$ )	Degree of Presence ( $P_i$ )	Index of Relative Presence ( $I_i$ )
Arthropods	40	74,0 %	22,8	40	60,6 %	21,3
<b>Reptiles</b> <i>(L. dugesii)</i>	<b>41</b>	<b>75,9 %</b>	<b>23,4</b>	<b>56</b>	<b>84,8 %</b>	<b>29,8</b>
Birds	26	48,1 %	14,9	18	27,2 %	9,6
Mammals	50	92,5 %	28,6	56	84,8 %	29,8
Plant matter	18	33,3 %	10,3	18	27,2 %	9,6
	1993 (N= 54)			1994 (N= 66)		



**Figure 2.** 'Degree of presence' ( $P_i$ ) of the different prey groups detected in pellets of *Falco tinnunculus canariensis*, in the years of 1993 and 1994.

The present study provides some information on the importance of Madeiran lizards in the diet of kestrels. From the Degree of Presence and the Index of Relative Presence in pellets (Figure 2), it is possible to say that lizards are an important constituent food item in the diet of kestrels in this particular region of Madeira Island. However, comparisons between food items based simply on the presence/absence of *taxa*, as reported here, cannot show that kestrels prefer or select lizards, because of the lack of abundance estimates of potential prey in the study area.

It is probable that the Index of Relative Presence values change during the year. They must be lower in winter for lizards when cooler, cloudy days reduce reptile activity. It is also likely that these values vary according to the differing ecological conditions locally, for example the degree of vegetation density and the effect this has on the kestrel's hunting ability.

To obtain a reliable assessment of the lizard's importance in the kestrel's diet, it will be necessary, in any future work, to measure the biomass involved as well as the variation of the diet composition, throughout the year. This will necessitate a different approach to the analysis of pellets.

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