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ROAD MORTALITY OF THE LITTLE OWL (*Athene noctua*) IN SPAIN

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ABSTRACT.—We studied the causes of road mortality of the Little Owl (*Athene noctua*) in Spain based on 418 road casualties and their relation to road characteristics and type of roadside cover. Road mortality presents a clear seasonal pattern and a summer peak (August) was found to be associated with postfledging dispersion. Road illumination decreases road mortality. Roadside cover has an important influence upon road casualties, possibly as a consequence of perching. Higher numbers of deaths occur in shrub type vegetation of <1 m height. These results and those obtained by other authors are discussed.

The Little Owl (*Athene noctua*) is the most generalist strigiforme in the Iberian Peninsula, and the most widely distributed and most common owl in Spain. In spite of this, many aspects of the biology of this species are unknown.

The Little Owl was poorly documented (Valverde 1967; Agelet 1979; Hoz 1982) until the studies of Mañez (1983a and 1983b). No information is available on the species' status in Spain, and mortality has never been studied in Spain (Clark et al. 1978). Mortality of strigiformes in Spain was poorly treated by Garzon (1977) and, particularly on *Bubo bubo* (see Gonzalez et al. 1980). Westernhagen (1962) reported on numerous road casualties of kites (*Milvus* sp.) in Andalusia (southern Spain) and Hass (1978) included Spanish roads in his study.

In Europe, particularly in Great Britain, Germany, the Netherlands and Denmark, road mortality among birds is well documented. Hodson (1962) studied the various types of roadside cover and its influence upon bird casualty numbers. Dunthorn and Errington (1964) made an attempt to measure the effects of such deaths on the bird population. Hansen (1969) divided roads into categories using traffic density as a norm and, lastly, Brautigam (1978) discussed the seasonal distribution of road deaths.

Nevertheless, the Little Owl appears only occasionally in those samples, and for this reason the results of these observers are dubious for application to the species and to Spain. The purpose of this study was to establish the causes of road mortality of the Little Owl in Spain and to advance knowledge on non-natural mortality of this species.

MATERIALS AND METHODS

Data were compiled in a 3-yr period (1984–1986) in Central Spain. A total of 418 collisions with cars in Spain were studied. Position, date of death and, when known, age of each owl casualty were recorded. Features of the road and the type of roadside cover were also recorded, including the presence or absence of illumination, the presence or absence of road margin vegetation and its features, and the type road.

Road margin vegetation was studied only in non-illuminated roads in an area of 20 m width from the road border and 10 m length on each side from the location of the carcass. Vegetation >3 m in height was considered as woodland. If no homogeneous vegetation was found, the presence of only 1 tree was deemed sufficient for classification as woodland. The other class of vegetation was shrub vegetation which was ≤3 m height.

In many cases no information was available on the distance from where a bird was found to the next curve in the road, and so, the types of roads have been classified by calculating the number of curves in 10 km of road. On this basis, three road classes resulted as follows: 1) roads with no more than 10 curves/10 km; 2) roads having between 10 and 25 curves/10 km; and 3) roads with >25 curves/10 km.

RESULTS

Of 418 total collisions recorded during the study, 40 were excluded due to insufficient data being available. Mortality caused by car collisions represents 82% of non-natural deaths in *Athene noctua,* although in some cases this value may be considerably higher. The remaining 18% were attributed as follows: shot (4.3%); caught in nest (3.1%); trapped (0.9%); preyed upon (3.5%); unknown (1.9%) and other causes (4.3%), including falling from nest, being waterlogged, cannibalism and starvation.

Results concerning the seasonal variation in mortality are given in Figure 1. The time of greatest mortality was recorded in summer. Between 1 August and 15 August we found 63.2% of the 378 deaths studied; 17.1% between 15 July and 31 July, and

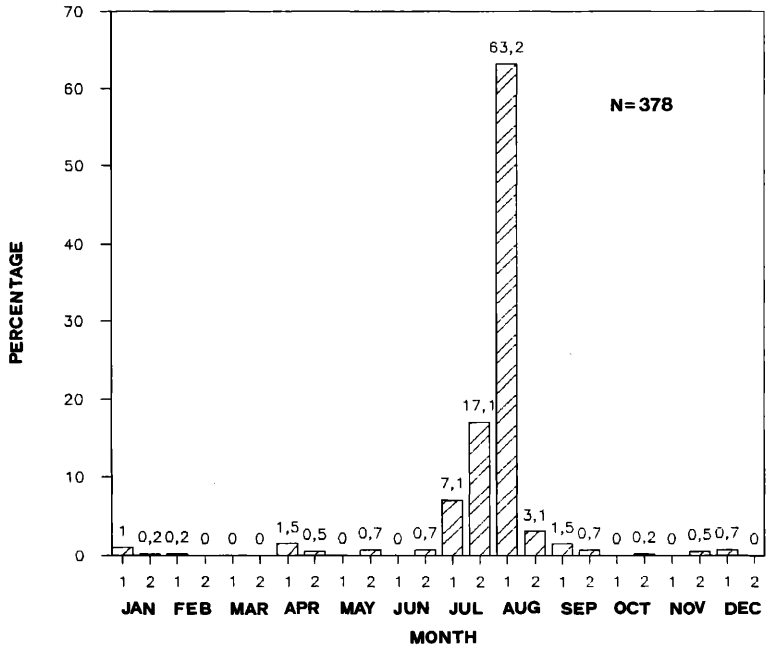

Figure 1. Histograms showing the pattern of seasonal mortality by half-month periods.

7.1% between 1 July and 15 July. During the remainder of the year (21 2-wk periods) were found the remaining 12.6% (47 deaths).

With respect to age of Little Owls found, among 353 (93.3%) found between 1 July and 1 November, only 25 (7.0%) were adults, the remainder being juvenile birds identified by their characteristic plumage.

All car collisions occurred during the night. On illuminated roads only 9 Little Owl deaths (2.3%, N = 378) were recorded, all of them being young owls; 369 (97.6%) were found on non-illuminated roads.

Power transmission or telephone lines parallel to roads were not associated with car collisions and are generally placed <20 m from the road.

Of the 369 deaths found on non-illuminated roads, in 75 cases (20.3%) there was woodland vegetation in the road margin area and in the remainder (294 cases, 79.6%) the vegetation was of the shrub type. We found 184 deaths (62.5%) occurred on roads with vegetation of no more than 0.5 m height and 110 deaths (37.4%) occurred on roads with a vegetation of 0.5–1 m height in road margins. On roads with a vegetation height of 1–3 m no deaths were found.

Often in the margin of several roads the two types of vegetation defined were alternatively distributed in which case carcasses were found only in areas of shrub vegetation.

Discussion

According to the available data, road casualties are the most important cause of non-natural mortality of the Little Owl in Spain. Nevertheless, it is possible that road deaths may have been over represented since birds killed on the road are more likely to be found than those killed in most other ways (Hodson and Snow 1965). In Europe deaths on roads are not as frequent but represent an important fraction of owls killed by human influence (Glue 1971; Weir 1971; Glue and Scott 1980; Exo and Hennes 1980).

Collisions with cars can be produced when bright lights at night cause temporary blindness of owls (Labisky 1960, *in litt.*) and as a result of owls swooping towards a moving light (Hodson 1962). Sutton (1927) suggested this as a cause of Screech Owls (*Otus asio*) being killed by cars. For these reasons and perhaps others, all road casualties occurred at night (M. Mañez, pers. comm.) and are also the main differences in road deaths between diurnal and nocturnal birds. Along illuminated roads, mortality

is less (only 2.3%), and possibly Little Owls are not blinded in illuminated areas or are so with less critical intensity.

Hansen (1969) suggested that bird behaviour determines whether a species is liable to be killed in traffic or not, and perhaps this can explain why the Little Owl is more frequently killed by cars than other owls. Road mortality presents a clear seasonal pattern. In the first half of August we found a very conspicuous increase in mortality (Fig. 1) producing 63.2% of the annual deaths in only 15 d approximately. Summer mortality has also been reported by Glue (1973, *in litt.*) and Exo and Hennes (1980). In our study, however, the summer peak occurred late in August and was not associated with stress of the breeding season as suggested by Exo and Hennes (1980) due to a greater proportion of young in our sample (92.9% between 1 July and 1 November), but to postfledging dispersion occurring during this time (Glue and Scott 1980). Glue and Scott (1980) found that between 1 July and 1 September 40% of young died, most of them on roads. Dunthorn and Errington (1964), Haas (1964), Hodson and Snow (1965) and Hansen (1969) have also reported an increase in road casualties during this time frame and note the influence of a greater proportion of inexperienced young on the observed increase.

The trend of the Little Owl to frequent open areas influences the relationship between number of deaths and roadside cover. Nevertheless, we think that, in this study, the influence is very small due to the small amount of open regions of the study area. The influence of road margin vegetation on casualties is a consequence of perch availability because owls are rarely killed while crossing roads. Vegetation of <1 m is classified as shrub and is not adequate for perching and causes Little Owls to use the pavement as a perch. Hodson (1962) established that much higher number of deaths occur opposite gaps and openings than along stretches of roadway with uniform border, because most birds are killed while attempting to fly from one side of the road to the other through these gaps (Dunthorn and Errington 1964).

The presence of trees in the proximity of a road (<20 m) was associated with decreased road mortality (20.3%). However, the most adequate vegetation, according to the information obtained is that between 1 and 3 m height and located at <20 m from the road and not woodland as found by Hodson (1962) for other birds. In many cases the perch was not a tree or a shrub but a wall or a barrier.

Table 1. Number and percentage of deaths of the Little Owl in Spain associated with various roadway conditions.

ROAD CONDITION	N	%
Road Characteristic		
Illuminated	9	2.3
Non-illuminated	369	97.6
Total	378	99.9
Roadside Cover		
Woodland	75	20.3
Shrub	294	79.6
Total	369	99.9
Shrub Height		
0.0–0.5 m	184	62.5
0.5–1.0 m	110	37.4
1.0–3.0 m	0	0
Total	294	99.9
Road Classification		
Class 1	32	8.4
Class 2	281	74.4
Class 3	65	17.1
Total	378	99.9

Speed and density of traffic have an important influence upon bird road casualties (Dunthorn and Errington 1964) and the greatest mortality is registered on roads where traffic is dense and fast moving (Hansen 1969). The number of casualties on Class 2 roads (Table 1) is higher than on those of Class 3 and Class 1. Nevertheless, the speed of traffic is the highest on Class 1 roads and is the lowest on Class 3. This may be explained by the fact that on Class 2 roads there are enough curves to prevent the owls from seeing cars far away, and also preventing cars from reaching high speed, while on Class 3 roads the speed should be low and on Class 1 roads cars are seen by the owls with time enough to leave the road.

Finally, as a practical measure to avoid car collisions of Little Owls, it is advisable to place trees or shrubs near roads, or if it is possible, 2 m height perches should be placed 5 m from the road border and 10 to 15 m apart.

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