

# Causes of admission of little owl (*Athene noctua*) at a wildlife rehabilitation centre in Catalonia (Spain) from 1995 to 2010

R. A. Molina–López & L. Darwich

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## Abstract

*Causes of admission of little owl (Athene noctua) at a wildlife rehabilitation centre in Catalonia (Spain) from 1995 to 2010.*— This retrospective study analyzes the causes of morbidity of little owl (*Athene noctua*) admitted to the Wildlife Rehabilitation Centre of Torreferrussa from 1995 to 2010. A total of 1,427 little owls were included in the study, with an average of 89 cases per year (range: 73–116). As regards the sex category, 80.7% animals (1,152/1,427) were classified as undetermined gender, 9.1% (130/1,427) were sexed as females and 10.2% (145/1,427) as males. The overall age distribution according to the calendar year showed that 66.6% (951/1,427) of birds were '1st calendar year' and 16.6% (237/1,427) were '> 1 calendar year'. Age could not be determined in 16.7% of birds. Primary causes of admission were orphaned young (53.2%), unknown trauma (24.7%), impact with motor vehicles (5.6%), other cause (5.5%), undetermined (3.7%), illegally captive (2.1%), natural diseases (2.1%), and gunshot (1.1%). Within the breeding season the frequency of admissions due to traumas –unknown trauma ( $\chi^2 = 147.108$ ;  $p < 0.001$ )– and impact with motor vehicles ( $\chi^2 = 28.528$ ;  $p < 0.001$ ) and other cause ( $\chi^2 = 11.420$ ;  $p = 0.003$ ) were the most important causes. In winter, admissions were mainly related to unknown trauma and gunshot. Over the fifteen years we observed a significant increase in the orphaned young category.

Key words: Little owl, Rehabilitation centres, Morbidity, Epidemiology.

## Resumen

*Causas de la admisión de mochuelos comunes (Athene noctua) en un centro de rehabilitación de animales salvajes de Cataluña (España) desde el 1995 al 2010.*— Este estudio retrospectivo analiza las causas de morbilidad de los mochuelos comunes (*Athene noctua*) admitidos en el Centro de Recuperación de Fauna Salvaje de Torreferrussa desde 1995 a 2010. En este estudio se incluyeron un total de 1.427 mochuelos comunes, con un promedio de 89 casos por año (rango: 73–116). Con referencia a la categoría sexual, el 80,7% de los animales (1.152/1.427) se clasificaron como de género indeterminado, un 9,1% (130/1.427) como hembras, y un 10,20% (145/1.427) como machos. La distribución general de edades, calculadas en años naturales, mostraba que un 66,6% de las aves (951/1.427) tenían un año natural, y que el 16,6% (237/1.427) eran menores de un año. En el 16,7% de las aves no se pudo determinar la edad. Las principales causas de admisión fueron jóvenes huérfanos (53,2%), trauma desconocido (24,7%), impacto de vehículos a motor (5,6%), otras causas (5,5%), por causas indeterminadas (3,7%), cautividad ilegal (2,1%), enfermedades naturales (2,1%), y disparos (1,1%). Durante la estación de cría, la frecuencia de admisiones debidas a traumas –trauma desconocido ( $\chi^2 = 147,108$ ;  $p < 0,001$ ) e impacto por vehículo a motor ( $\chi^2 = 28,528$ ;  $p < 0,001$ )– y otras causas ( $\chi^2 = 11,420$ ;  $p = 0,003$ ), fueron las causas más importantes. En invierno, las admisiones se producían principalmente en relación con traumas desconocidos y disparos. Durante el periodo de 15 años observamos un aumento significativo en la categoría de jóvenes huérfanos.

Palabras clave: Mochuelo común, Centros de Recuperación, Morbilidad, Epidemiología.

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Rafael A. Molina–López, Centre de Fauna Salvatge de Torreferrussa, Catalan Wildlife Service, Forestal Catalana, 08130 Santa Perpètua de la Mogoda, Espanya (Spain).– Laila Darwich, Dept de Sanitat i Anatomia Animals, Fac. of Veterinary, Univ. Autònoma de Barcelona, 08193 Bellaterra, Espanya (Spain).

Corresponding author: Rafael A. Molina–López

## Introduction

Birds of prey and owls have become valuable sentinels of environmental changes because of their position on the ecological food chain (Kovács et al., 2008; Sergio et al., 2006). Moreover, identifying and understanding causes of the variation or decline of wildlife population is essential in order to implement conservation measures (Salafsky et al., 2008). Morbidity and mortality studies, including those based on data from wildlife rehabilitation centres (WWC), have complemented the understanding of menaces posed to raptors by identifying the underlying natural and anthropogenic factors. WWCs have therefore become a key data source, providing valuable information concerning the health of ecosystems (Sleeman, 2008).

The population of free-living little owls (*Athene noctua*) in Europe is considered to be in moderate decline (Burfield, 2008). The decrease has been related to changes in their habitat, resulting in a fragmented and isolated breeding population (Exo, 2005). Catalonia is an Autonomous Community in Spain located in the Mediterranean subregion of the western Palaearctic (3° 19'–0° 9' E and 42° 51'–40° 1' N). Eight different owl species have been observed in this area, most of them being breeding species (Estrada et al., 2004). In Catalonia, a decrease in their distribution area has also been reported and the little owl is considered near threatened (Framis, 2011).

Epidemiological studies of little owl focusing on morbidity and mortality are scarce (Hernández, 1988), especially those covering a long period of time. The objective of the present study was to analyze the main causes of morbidity and mortality of the little owl population admitted to the Wildlife Rehabilitation Centre of Torreferrussa (Catalonia) over a fifteen-year period.

## Methods

### Study design and animals

A retrospective unicentric study was performed using the original medical records of wild little owls hospitalized at the Wildlife Rehabilitation Centre of Torreferrussa (Catalonia, North-East Spain) from 1995 to 2010. Non-wild born individuals and cases with no epidemiological information were excluded from the analysis.

### Definition of variables

The following variables were included in the analyses: species, sex, age, date and primary cause of admission. Sex was determined when possible by gonadal inspection during clinical diagnostic procedures or at necropsy. Age was categorized as '1st calendar year' and '> 1 calendar year' according to Martínez et al. (2001). The year was divided into three seasons: breeding (from March to July), post-nuptial migration (from August to October) and wintering (from November to February), according to Herrando et al. (2011).

General classification of primary morbidity and mortality causes was adapted from the categories defined

by different authors (Morishita et al., 1998; Wendell et al., 2002; Naldo & Samour, 2004) and were based on definitive diagnoses, as follows: trauma, toxicosis, infectious and parasitic diseases, metabolic or nutritional diseases, orphaned young birds, and undetermined. The metabolic, nutritional, infectious, and parasitic categories were grouped as natural disease. The overall trauma category was subdivided into specific causes as follows: collision, electrocution, gunshot, trap, predation and unknown trauma. Collision traumas were further subdivided into impacts with motor vehicles, buildings, power lines, fences and other. The orphaned young category was composed of chicks and fledging raptors, and also included healthy young birds that were unable to survive in the wild unassisted.

Two further causes, illegal captivity and other causes, were used. Basically, the illegal captivity category referred to wild birds maintained illegally in captivity for more than six months. 'Other causes' was considered when no medical primary cause could be attributed; this category included animals found inside buildings, farms or other human structures, animals with dirty feathers, animals entangled by plants or found wet or disoriented after storms.

Clinical diagnoses were based on veterinarians' reports and case history. These included physical examination at the time of admission and data from complementary diagnostic tools.

### Statistical analysis

Descriptive statistics, normality test and inferential analyses were done at 95% of confidence with SPSS Advanced Models™ 15.0 (SPSS Inc. 233 South Wacker Drive, 11th Floor Chicago, IL 60606–6412).  $\chi^2$  test was used to compare proportions when appropriate. Causes were analyzed for variations between gender, age and differences within the year or among different years of the study. Trend analyses were applied when appropriate for specific causes to detect differences among years.

## Results

A total of 1,427 birds were included in the study, with an average of 89 (SD = 13.2; range 73–116) cases per year. Most animals (94.8%,  $n = 1,352$ ) were alive on admission to the Centre.

As regards the sex category, most animals, 80.7% ( $n = 1,152$ ), were classified as undetermined gender, 9.1% ( $n = 130$ ) were sexed as females and 10.2% ( $n = 145$ ) as males. The overall distribution of age according to the calendar year showed that 66.6% ( $n = 951$ ) of the birds were within the '1st calendar year', 16.6% ( $n = 237$ ) '> 1 calendar year', and the age was unknown for 16.7% ( $n = 239$ ) of the birds. Seventy-six percent ( $n = 999$ ) of the admissions were derived from regions near the rehabilitation centre, mainly from the province of Barcelona (North-East Spain, 3° 19'–0° 9' E and 42° 51'–40° 31' N).

The most frequent causes of admission were orphaned young, 53.2% ( $n = 759$ ), and unknown trauma,

Table 1. Causes of little owl admission according to sex and age: 1cy. 1st calendar year; > 1cy. > 1 calendar year; Unk. Unknown.

*Tabla 1. Causas de admisión de mochuelos comunes, según el sexo y la edad. (Para las abreviaturas, ver arriba)*

Cause of admission	Sex			Age		
	Female	Male	Unk	1cy	> 1cy	Unk
Gunshot	2	4	9	2	7	6
Illegally captive	1	3	26	10	11	9
Impact with motor vehicles	11	8	61	29	28	23
Natural disease	7	6	17	12	13	5
Orphaned young	28	39	692	729	9	21
Other	5	3	20	12	9	7
Undetermined	2	11	40	11	12	30
Unknown trauma	64	67	222	115	122	116
Other cause	10	4	65	31	26	22
Total	130	145	1,152	951	237	239

24.7% (n = 353). In decreasing order of frequency, the other primary causes were: trauma with motor vehicles, 5.6% (n = 80); other cause, 5.5% (n = 79); undetermined, 3.7% (n = 53); , illegally captive, 2.1% (n = 30); natural diseases, 2.1% (n = 30); and gunshot 1.1% (n = 15). Other causes included 56 cases found inside buildings, 14 of them trapped in chimneys. Causes with frequencies below 1% have been grouped in a whole category named 'others' (2%), which included animals suffering from predation (n = 6), trauma with building (n = 8), traps (n = 4), electrocution (n = 4), or fences (n = 6). No cases of intoxication were diagnosed. Table 1 summarizes the diagnostic categories by sex and age.

Differences between gender and age were analysed for causes in more than 15 cases: orphaned young, unknown trauma, trauma with motor vehicles, illegally captive, natural diseases and other causes. Significant differences between genders was only observed in the undetermined category ( $\chi^2 = 5.567$ ; df = 01;  $p = 0.018$ ), with a higher frequency of males. For age-related comparisons, after removing the orphaned young category (which included all individuals at the 1st calendar year), from the analysis we did not observe any differences between ages in any of the admission categories.

As regards the seasonal effect on the prevalence of morbidity causes, we observed that the highest number of orphaned young cases was concentrated during the breeding period, as expected (table 2). Moreover, within the breeding season, the frequency of admissions due to traumas –unknown trauma ( $\chi^2 = 147.108$ ;  $p < 0.001$ ) and impact with motor vehicles ( $\chi^2 = 28.528$ ;  $p < 0.001$ )– and 'other causes' ( $\chi^2 = 11.420$ ;  $p = 0.003$ ) were the most important causes. During the post-nuptial migration period, we observed an increase in cases admitted due to traumatism, but we also had the

lowest prevalence of illegally captive animals. Finally, in the winter, cases were mainly related to unknown trauma and gunshot.

Trend analyses of the morbidity causes over the fifteen years of the study revealed a significant increase in the orphaned young category (Test of trend  $Z = 2.9$ ;  $p = 0.003$ ).

## Discussion

Epidemiological studies of wildlife based on review of the morbidity and mortality reports of free-living animals admitted to rehabilitation centres are an important source of information about the health status and non-natural menaces of wild populations (Sleeman & Clark, 2003). Many such studies, however, may be biased due to lack of randomization or overrepresentation of anthropogenic casualties (Real et al., 2001; Newton, 2002). Moreover, reports on owl morbidity and mortality in Spain are scarce (Fajardo, 1990; Fajardo et al., 1994; Martínez et al., 2006), specifically those including little owl casualties (Martínez et al., 1996). The originality of the data presented in the present study is based on the large series of cases of little owl and the long study period.

Anthropogenic origin has been confirmed as the most frequent cause of admission, ranging from direct persecution (gunshot, illegal captivity or traps) to involuntary human-induced threats such as collisions with vehicles or buildings, fences, electrocution and other causes.

The most evident finding in the present study was the high proportion of young orphaned birds admitted to the centre. They represented 53% of the total cases and furthermore, the number tended to increase over

Table 2. Causes of little owl admissions over the year.

Tabla 2. Causas de admisión de mochuelos comunes durante el año.

Cause of admission	Season			Total N
	Breeding	Migration	Wintering	
Gunshot	3	1	11	15
Illegally captive	14	6	10	30
Impact with motor vehicles	42	28	10	80
Natural disease	19	9	2	30
Orphaned young	713	40	6	759
Others	17	6	5	28
Undetermined	35	15	3	53
Unknown trauma	182	93	78	353
Other cause	47	18	14	79
Total	1,072	216	139	1,427

the study period (1995 to 2010). This value is higher than that reported by Martínez et al. (30.4%,  $n = 79$ ) in 1996. One explanation may be that the region of our study has a high human population density and there has been a marked transformation of land. Nesting of little owls in this area occurs in a variety of sites, such as buildings, roof tiles, rock piles and cavities of trees. Thus, when chicks and fledging owlets become 'branchers' and climb around the nest they are more likely to be found and brought to the wildlife rehabilitation centres. Education and information programmes need to be implemented to reduce the capture of those birds unless it is confirmed they have been deserted by the parents or if signs of illness are evident.

Trauma was the second cause of admission, but unknown trauma still remains the most important category in this group. To solve these limitations of classification, information should be systematically collected at the centres at the time of admission whenever possible. Impact with motor vehicles was the second traumatic cause with 5.6% of prevalence, but lower than the 10% ( $n = 26$ ) reported by Martínez et al. (1996). The highest incidence of collisions was observed during the breeding and post-breeding period, coinciding with results reported by Hernández (1988) and Frías (1999). Vehicle strikes have also been widely described in Catalonia by Baucells (2010) and are one of the most important causes of human-induced mortality in Europe (Van Nieuwenhuysse et al., 2008).

Although the number of cases is very low, we recorded six cases of electrocution, a finding rarely reported in this species. Despite the size of the little owl, its perching behaviour could be considered a risk factor for electrocution, especially in low power lines.

Even though owls are a legally protected species in Catalonia (Departament de la Presidència, 2008), we

found 15 cases of gunshot, most of which occurred during the winter hunting season (12/15). Although incidental hunting could be a reasonable explanation for this finding, deliberate persecution could not be discarded, as suggested by Mañosa (2002).

The third cause of admission was the 'other cause' category, which comprised birds found inside buildings or other human constructions. Trappings in chimneys and immersions in water ponds are well documented causes of mortality in Europe (Van Nieuwenhuysse et al., 2008) and seem related to the vicinity of little owl territories to human settlements, allowing animals incidental visits to the buildings. In our report, most little owls found inside buildings were found alive but they had poor body condition and feather damage, resulting in worse clinical prognosis.

Illegal captivity of wild little owls is still a cause of admission in rehabilitation centres in Spain (Martínez et al., 1996). Such little owls were probably captured when young and maintained as pets in captivity. Natural diseases, such as metabolic, nutritional, infectious, or parasitic diseases, made up a miscellaneous list of clinical entities. Data on live birds from rehabilitation centres allow the description of primary or secondary natural diseases. In mortality studies, natural causes of death are underestimated due to the decomposition of the carcasses (Newton et al., 1999). In our study, the most frequent primary clinical presentation was poor body condition and weakness, followed by ocular alterations. No cases of intoxication were diagnosed, but this cause has probably been underestimated in our review. Further investigation is necessary to ascertain the relevance of this cause. Finally, the proportion of undetermined causes presented similar values to those in other retrospective works (Kommenou et al., 2005), demonstrating that the limitation of obtaining a specific diagnosis in wild birds remains, a subject of concern.

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