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Source: Journal of Raptor Research, 40(3) : 231-235

Published By: Raptor Research Foundation

URL: https://doi.org/10.3356/0892-1016(2006)40[231:ADAOFE]2.0.CO;2

J. Raptor Res. 40(3):231–235

ADMISSIONS, DIAGNOSES, AND OUTCOMES FOR EURASIAN SPARROWHAWKS (*ACCIPITER NISUS*) BROUGHT TO A WILDLIFE REHABILITATION CENTER IN ENGLAND

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KEY WORDS: *Eurasian Sparrowhawk*; Accipiter nisus; *rehabilitation*; *mortality*; *collision*.

The Eurasian Sparrowhawk (*Accipiter nisus*) is one of the smallest birds of prey in Europe (Newton 1986) and, with over 30 000 breeding pairs (Snow and Perrins 1998), is one of the most common diurnal birds of prey in Great Britain. Females are bigger than males but sexual size dimorphism is extreme in the Eurasian Sparrowhawk. Females weigh, on average, 290 g with males weighing about 150 g (Newton 1986). In a study of a population in southwestern Scotland, avian prey made up 97% of the diet of Eurasian Sparrowhawks during the breeding season (Newton 1986). A comparison of prey items taken during the incubation period and post-fledging period showed that males took prey up to 120 g (larger thrush species), while females regularly took prey up to 500 g (e.g., Common Wood-Pigeons [*Columba palumbus*]). The diet of recently-fledged juvenile sparrowhawks was similar to that of the adults, although it contained more fledglings, which presumably made easier targets (Newton 1986).

Like most woodland raptors, Eurasian Sparrowhawks are well-adapted to their habitat with a small head, slim body, short wings, and a long tail. These features allow the sparrowhawk great maneuverability and speed, indispensable traits for predators of small songbirds (Newton 1986). However, these characteristics also make the sparrowhawk vulnerable to collision with objects such as windows and vehicles, an important cause of mortality in this species. In a 35 yr study of 1781 sparrowhawk carcasses, Newton et al. (1999) found that 65% of the birds had died as a result of trauma caused by collision, particularly with windows. In addition to this high mortality, many sparrowhawks are found injured by members of the public and taken to

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wildlife rehabilitators or veterinary surgeons for treatment. However, very little information is available on the types of injuries sustained or the success of treating these injuries. In addition, in most cases, there is very little information on post-release survival of rehabilitated raptors and other wildlife (Sharp 1996, Goldsworthy et al. 2000).

There are over 800 wildlife rehabilitation centers in the U.K (A. Grogan pers. comm.), many of which treat and rehabilitate injured raptors including Eurasian Sparrowhawks. The Royal Society for the Prevention of Cruelty to Animals (RSPCA) has four wildlife rehabilitation centers that collectively receive and treat over 100 sparrowhawks each year. Here, we retrospectively examined the reason for admission of sparrowhawks to RSPCA Stapeley Grange Wildlife Centre (SGWC) in northwestern England over a 5 yr period and assessed the outcome of treatment and rehabilitation. We looked for seasonal trends in the reasons for admission, and assessed the effects of age, sex, reason for admission, and clinical diagnosis on the likelihood of successful rehabilitation and release.

METHODS

Reasons for Admission, Clinical Diagnoses, and Outcomes. We examined the clinical record cards of sparrowhawks admitted to SGWC between January 2000 and December 2004. The reason for admission was recorded as: traumatic injury caused by collision (road traffic accident [RTA], window, other); traumatic injury of unknown origin; grounded (reason unknown); other. The date of admission, age (adult, juvenile, unknown) and sex (male, female, unknown) were recorded. Admissions were divided into the following time periods: January–March; April–June; July–September or October–December. The fate of each bird admitted was recorded as: DOA (dead on arrival); EA (euthanized on admission or within 24 hours); EC (euthanized in care following unsuccessful treatment); DC (died in care despite treatment); RL (released following successful treatment and rehabilitation).

Clinical diagnosis was recorded for each bird as: concussion/head trauma, fracture(s), undetermined trauma (leg injuries but not fractures, soft tissue injuries, forelimb lameness, internal injuries), no apparent damage (included grounded birds that were thin but otherwise had no obvious injuries), or other (included shot birds with no fractures, birds that may have been poisoned, and birds with damage to the central nervous system).

Statistical Analysis. The likelihood of successful rehabilitation and release were analysed using binary logistic regression in GLIM 3.77, with outcome (released or died/euthanized) being the binary response variable (released = 1, died/euthanized = 0), specifying a binomial error structure with the binomial denominator set to 1 and using the logit-link function (Crawley 1993). Explanatory variables were year, season admitted, reason for admission, clinical diagnosis, sex, and age (all categorical variables) and weight on admission (continuous). We also looked for interaction effects between age and sex. The significance of each factor was determined by comparing the change in scaled deviance on removing a factor with χ^2 tables at the appropriate degrees of freedom (Crawley 1993). The proportions of birds with fractures versus birds with no fractures that were subsequently released were compared using a *G*-test in GLIM.

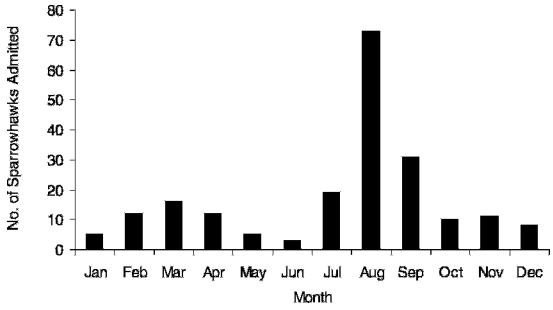

Figure 1. Seasonal variation in the number of sparrowhawks admitted to Stapeley Grange Wildlife Centre, pooled for 5 yr, 2000–04.

RESULTS

Between January 2000 and December 2004, 205 sparrowhawks were admitted to SGWC, an average of 41/yr. Most birds were adults (140 of 170 for which age was recorded; 82%), and only in July–September were any of the birds admitted classified as juveniles. Males made up 44% of those sexed ($N = 137$).

Reasons for Admission. Of the 202 birds for which the reason for admission was recorded, 38% had traumatic injury of unknown origin, 32% were admitted following collision (RTA or collision with other objects such as windows), 19% were grounded, and 11% were admitted for other reasons. Reason for admission had no effect on the likelihood of the bird being released ($\chi^2_3 = 5.2$, $P > 0.05$).

Seasonal Variation. The number of sparrowhawks admitted to SGWC decreased from 55 in 2000 to 29 in 2003 and 2004, and seasonal variation in the number of birds admitted resulted mainly from the majority of birds being admitted during July–September (Fig. 1). However, neither the year nor the season admitted had a significant effect on the likelihood of birds being released (year: $\chi^2_4 = 7.1$, $P > 0.05$; season: $\chi^2_3 = 3.2$, $P > 0.05$).

Table 1. Number of Eurasian Sparrowhawks admitted to Stapeley Grange Wildlife Centre, and number released, by clinical diagnosis, 2000–04.

	Sparrowhawks Admitted	Sparrowhawks Released	
Clinical Diagnosis	*N*	*N*	(%)
Concussion/head trauma	22	12	54.5
Fracture (radius, ulna, etc.)	110	12	10.9
Undetermined trauma	25	10	40.0
No apparent damage	34	16	47.1
Other[1]	12	0	0.0

[1] Diagnosis of ''other'' included suspected poisoning and shot.

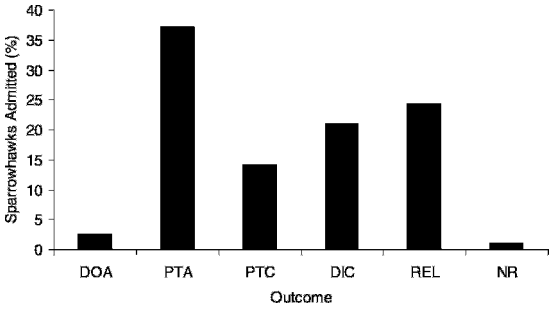

Figure 2. Percentage of sparrowhawks ($N = 205$) admitted to Stapeley Grange Wildlife Centre that were dead on arrival (DOA), euthanized on admission or within 24 hr (PTA), euthanized following unsuccessful treatment (PTC), died in care despite treatment (DIC), released following successful treatment and rehabilitation (REL) and outcome not recorded (NR), 2000–2004.

Clinical Diagnosis. The most common diagnosis (52%) was fracture of wing bones (mainly ulna and radius). Fifteen percent of birds had sustained traumatic injuries (without any fractures), 11% were suffering from concussion, 11% had no obvious physical damage and 11% were admitted for other reasons. Many birds had multiple fractures and head trauma consistent with collision injuries. Clinical diagnosis had a significant effect on the likelihood of successful rehabilitation and release ($\chi^2_4 = 19.8$, $P < 0.001$; Table 1). The likelihood of release was significantly lower ($\chi^2_1 = 15.3$, $P < 0.05$) for birds with fractures (10.9%), compared with birds that had not sustained fractures (40.8%).

Outcome. Only 50 sparrowhawks (24%) were released following rehabilitation (Fig. 2). Of these, 16 had no major physical injuries and had been admitted for minor injuries or poor condition, 12 were suffering from concussion, and 10 from traumatic injuries (not fractures). Of the 12 released following treatment for fractures, eight had sustained a fracture of either the left or right ulna. Sex had a significant effect on the likelihood of being released ($\chi^2_1 = 8.3$, $P < 0.05$), females being more likely to be released than males (Table 2). Age had no effect on the likelihood of release ($\chi^2_1 = 0.1$, $P > 0.05$). However, there was a significant interaction between age and sex ($\chi^2_1 = 5.5$, $P < 0.01$), suggesting that there was a difference in the likelihood of release between adults and juveniles of the two sexes (Table 2).

DISCUSSION

We found significant seasonal variation in the admission of Eurasian Sparrowhawks to SGWC. Birds were more likely to be admitted between July and September (60%), although there was a smaller peak in March. Newton et al. (1999) found a similar peak in recorded mortality of sparrowhawks from the analyses of carcasses received over a 35 yr period. They reported that the majority of carcasses recovered during August–September were recently-independent juveniles. In contrast, we found that the majority of birds brought to SGWC for rehabilitation during July–September were adults (82% of those of known age). One reason for this may be that around fledging time, the adults must forage frequently to provide sufficient food for the young birds, which may make them more susceptible to collisions (I. Newton pers. comm.). Our data were based on live recoveries and may be skewed toward adults as they may be more likely to survive following injury than juveniles. Inexperienced juveniles may more easily starve to death than adults. Although northern populations of sparrowhawks are migratory, the British population is relatively sedentary (Newton 1986). Thus, it is unlikely that increased movement of adults due to migration could explain why the majority of birds admitted to the center between July and September were adults.

Table 2. Number of adult and juvenile male and female sparrowhawks released, Stapeley Grange Wildlife Centre, 2000–04.

	Sex			
Age	Male	Female	Unknown	Total
Adult	9	25	2	36
Juvenile	5	4	1	10
Unknown	1	3	0	4
Total	15	32	3	50

More than 70% of sparrowhawks admitted to SGWC had been the victims of collisions with windows or road vehicles, or exhibited trauma consistent with having been in a collision. Newton et al. (1999) found that a similar proportion of sparrowhawks had died in the same way. Collision with vehicles is an important cause of mortality for raptors and other birds (Loos and Kerlinger 1993, Franson et al. 1996, Fajardo et al. 2000). In our study, the reason for admission itself had no effect on the likelihood of an individual being released. This was unsurprising, as there are a range of injuries consistent with having been in a collision, some of which are more serious than others. However, the clinical diagnosis did have a significant effect on the likelihood of an individual being released. Fifty-two percent of birds admitted to SGWC had sustained one or more fractures, mostly of the radius and/or ulna. Birds with fractures were more likely to be euthanized while in care than birds without fractures. Of the 50 birds released over the 5 yr period, only 12 (24%) had been admitted with fractures and of these, eight had a fracture of the left or right ulna. None of the released birds that had been admitted with fractures required surgical intervention and the fractures resolved with strapping and cage rest. At least five birds with fractures that required surgical intervention died under general anaesthetic.

We released only 24% of sparrowhawks admitted to SGWC. Although this figure may seem low, the majority

of birds had injuries that precluded them from possible release and therefore were euthanized, thus conforming to the RSPCA policy on wildlife rehabilitation. Our release rate is comparable to other RSPCA centers but slightly lower than other rehabilitation centers (A. Kelly and M. Bland unpubl. data). Our data could be used by wildlife rehabilitators to better predict the outcome for individual birds based on their clinical diagnosis. Thirty-five percent of sparrowhawks admitted to SGWC were either euthanized while in care (>24 hr) or died in care despite treatment. In the case of the RSPCA, these data could be used by field staff (Inspectors and Animal Collection Officers) to improve triage in the field.

Successful release does not equate to successful rehabilitation (Sharp 1996) and little is known about post-release success of rehabilitated wildlife. Although some rehabilitated raptors can be returned to the wild successfully (Martell et al. 2000), there is little information available on the post-release survival of rehabilitated sparrowhawks. Joys et al. (2003) found that the median time elapsed between ringing and recovery (excluding the first two months following release) was 194 and 433.5 d, respectively, for rehabilitated sparrowhawks, (N = 13) and those that were trapped and released (N = 878). However, Joys et al. (2003) did not report the rehabilitation methods used by different rehabilitators or attempt to link the clinical diagnoses with the post-release survival rates. The methods of treatment and rehabilitation, and practices of individual wildlife centers are likely to have a significant effect on post-release survival, even within the RSPCA (Garland et al. 2003, Baker and Harris 2004). For this reason we recommend more post-release monitoring of rehabilitated sparrowhawks and other wildlife to determine the effectiveness of rehabilitation. We suggest that wildlife rehabilitators become involved in post-release monitoring. Radiotelemetry and ring recovery data can be used to give an indication of short- and long-term survival, and radio-tracking allows a comparison of habitat use, foraging success, and dispersal of rehabilitated and non-rehabilitated sparrowhawks.

ADMISIONES, DIAGNÓSTICOS Y RESULTADOS PARA INDIVIDUOS DE *ACCIPITER NISUS* RECIBIDOS EN UN CENTRO DE REHABILITACIÓN DE VIDA SILVESTRE EN INGLATERRA

RESUMEN.—Examinamos retrospectivamente las razones para la admisión, el diagnóstico y el resultado de gavilanes de la especie *Accipiter nisus* llevados a un centro para la rehabilitación de fauna silvestre situado en el noroeste de Inglaterra durante un período de cinco años (2000–2004). En total, 205 aves fueron admitidas durante este período, la mayoría adultas. No se notó una diferencia significativa en el número entre machos y hembras. Hubo una variación estacional significativa en el número de aves recibidas: la mayoría se recibieron entre julio y septiembre, un lapso que comprende las etapas finales de la etapa de anidación, el período posterior al emplumamiento y el período en que los volantones muestran las primeras señales de independencia. La mayoría de las admisiones (70%) se debieron a colisiones y a heridas traumáticas de origen desconocido. Sólo el 24% de las aves fueron puestas en libertad luego de su tratamiento y rehabilitación. El diagnóstico clínico tuvo un efecto significativo en la probabilidad de su subsiguiente puesta en libertad. Las aves con menor probabilidad de ser liberadas fueron aquellas con fracturas óseas o daños sufridos en el sistema nervioso central. De doce aves liberadas luego de recibir tratamiento por fracturas, ocho tenían cúbitos fracturados. Con el fin de de evaluar el éxito de la rehabilitación, recomendamos un mayor control luego de que los gavilanes rehabilitados son puestos en libertad.

[Traducción de los autores editada]

ACKNOWLEDGMENTS

We thank the staff at RSPCA Stapeley Grange Wildlife Centre for their assistance in data collection. We would also like to thank Professor Ian Newton for comments on an earlier version of this manuscript and Perla Moraghan for translating the abstract. Thanks to Jim Watson, Mark Martell, Rob Bierregaard (and the staff of the Carolina Raptor Center) and an anonymous referee for improving the original manuscript.

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Received 8 November 2005; accepted 15 July 2006
Associate Editor: James W. Watson