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The use of Electrical Transmission Pylons as Nesting Sites by the Kestrel *Falco tinnunculus* in North-East Italy

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ABSTRACT

In 1994, a study of the population ecology of the Common Kestrel, *Falco t. tinnunculus*, was initiated in the mainly agricultural Eastern Friulanin Plain (Northeast Italy). In the 400 km^2 studied area, 48 territorial pairs were identified as were 49 nest sites. 28 (57%) of these nest sites were located in old corvid stick nests on medium and high tension metal latticed electrical transmission line pylons. The productivity of these sites were similar to the other successful sites, though they were much more prone to nest collapse (n=4) due mainly to the age of the stick nests present. This population's nest characteristics, density, and distribution are presented. Kestrel use of pylons and the regional variation of Kestrel nest sites is discussed.

INTRODUCTION

Electrical transmission towers and poles have been reported to have been used by many species of birds of prey for nesting; from only a partial review, over 35 diurnal species are listed in the literature (see Blue, in press; Brown & Lawson, 1989; Olendorff *et al.*, 1981), seven of which are falcons (*Falco* spp.) and are listed in Table 1.

A brief review of these reports of falcon pylon nesting shows that the majority of species (Lanner Falcon, Praire Falcon, Kestrel, Greater Kestrel) were considered to be in areas where other suitable sites were lacking. Nesting occurred for falcons where other species, particular corvids but also other raptors and storks, had previously built stick nests. American Kestrels nesting on electrical line infrastructure however were reported to have used wooden pylons with holes large enough for nesting. Pylon may even make up over 50% of the sites used by some of the species over large areas (e.g., *F. biarmicus* in Trasvaal; *F. tinnunculus*, this

Table 1. Reports of falcons nesting on electrical line infrastructure

Species	*References*
Saker Falcon, *F. cherrug*	Galushin, pers. comm.
Lanner Falcon, *F. biarmicus*	Kemp, 1972; Tarboton & Allan, 1984; Brown & Lawson, 1989; Tarboton, 1989; McIlleron *et al.*, 1989
Prairie Falcon, *F. mexicanus*	Roppe *et al.*, 1989; Blue, in press
Eurasian Hobby, *F. subbuteo*	Conradi, in Fellenberg, 1988; Dronneau & Wassmer, 1986; Danko, 1986; Derrient & Wohlgemuth, 1992; Fellenberg, 1987, 1988a, 1988b, 1989, 1990; Fiuczynski, 1987; Galushin_*et al.*, 1995; Gluer *et al*, 1990; Herkenrath *et al.*, in Fellenberg, 1987; Holzinger, 1987; Looft & Busch, 1981; G. Speer, pers. comm.; J.-C. Tombal, pers. comm.
Kestrel, *F. tinnunculus*	Anon., 1991; Boshoff *et al.*, 1983; Brown, 1976; Brown & Lawson, 1989; Cambi, 1982; Chiavetta, pers. comm.; Cramp & Simmons, 1980; Florit *et al.*, 1992; Galushin, pers. comm.; Gursan, pers. comm.; Henrioux, pers. comm.; Krueger, unpubl. ms.; Parodi, 1987; Rockenbauch, in Cade, 1982; G. Speer, pers. comm.; J.-C. Tombal, pers. comm.; Village, 1990
American Kestrel, *F. sparverius*	Blue, in press; Illinois Power Company in Olendorff *et al.*, 1981
Greater Kestrel, *F. rupicloides*	Brown & Lawson, 1989; Kemp, 1978, 1984

study); though typically are few in number. Other factors may be important as well, as it is suggested for the Saker that the current use of pylons as nesting sites is due to human persecution (V. Galushin, pers. comm.). And the nests on pylons are typically reported as being successful, and few problems are mentioned.

The Kestrel has been found to use such sites throughout its range in many circumstances but always in a limited number. This paper presents part of the results from the first year of study of the population nesting in the eastern Friulanin Plain, especially their use of electrical pylons for nesting, and its effect on success and productivity, as well as a discussion of Kestrel nest site type usage and variations in general.

METHODS AND STUDY AREA

Between April and August, 1994, a complete censusing of the study area was carried out, by car and foot, utilizing the road and dirt track network throughout the area. All individuals were followed and many likely nesting areas searched to determine Kestrel breeding status and identify nest sites through repeated visits. All sites and areas of known Kestrel activity were visited at least once a week, and many lengthy periods of observation were carried out on many aspects of Kestrel behaviour and ecology. Statistical analyses were performed using SPSS-PC+ programme.

A 400 km^2 area in the provinces of Gorizia and Udine (northeast Italy) was studied, which is mainly an urbanized and cultivated alluvial plain. Submediterranean in relation to temperature, precipitation, and vegetation, and comprised of four main habitat types: open agricultural areas of mixed farmland, arable land, and vineyards; carsic areas with open shrub and wooded vegetation; urbanized areas; and, wooded and open foothills (270, 64, 50, and 16 Km^2, respectively)(Anon., 1984).

RESULTS

In the study area, 46 nesting sites were identified; 28 of these were on electrical distribution metal-latticed pylons (60.8%): 10 on 20-26 m tall pylons (20 kV and 130 kV), and 18 on 13 m tall pylons (20 kV). Other nest site types were utilized as well: 14 trees (12 deciduous, 2 coniferous), 1 bridge underpass, 1 rock quarry highwall, 1 large industrial barrack, and 1 masonry farm building. Nest site structure height mean was 16.41 m (SD=7.94, range=5-50m, n=46).

Of the 46 nest identified, 42 were in corvid-built stick nests (91.3%)-either Hooded Crow *Corvus corvus cornix* or Magpie *Pica pica*; 4 were on horizontal surfaces (rock, metal, cement, and masonry substrates). The nest height mean was 14.63 m (SD=6.74, range=3.5-35 m, n=46). 14 of the nests were in a tree canopy or enclosed; 32 were open on all sides.

The distribution of the nest sites was loosely clumped and appeared regularly spaced between the individual sites; a variably sized exclusive and defended area surrounded each nest site. The nearest neighbour nest distance was a mean of 1024.5 m (SD=626.6 m, range=235-2600, n=50). All Kestrel nesting (and hunting activity) was in the 270 sq. km area cultivated plain and associated open areas. The other areas present in the study area were not used.

A summary of the breeding performance is given in Table 2. Three nonbreeding males were present in the study area as well. And the diet of the Kestrels throughout the year in this area is over 90% (by biomass from pellet analysis and by prey deliveries) small mammals (Krueger, unpubl. ms.).

Differences in Kestrel fledging success between electrical pylon sites and tree sites, as well as all non pylon sites combined, were not statistically significant (using the Student's two-tailed t-test), either between young fledged per pair or young per successful pair. A significant difference in productivity was observed only between the 13 m and the 20+ m tall pylons and the number of young fledged from the successful nests (t=1.79, d.f.=26, sig.=less than 0.05). The mean number of young fledged from all pairs on both site types was 2.11 (SD=1.78, N=18) and 3.30 (SD=1.49, N=10), apparently different though not statistically significant. The difference can be explained by the relative number of collapsed and failed nests between the two pylon types (6 and 2, respectively).

Table 2. Summary of 1994 breeding performance of Kestrels in the eastern Friulanin Plain

Number territorial pairs with nest site		49
Number pairs with eggs laid		44
with hatched young		41
with fledged young		40
Percentage of clutches that produced young *		90.0%
Mean young fledged per successful pair		3.46(SD=1.07)
Mean young fledged per territorial pair		2.76(SD=1.65)
Mean number of young fledged per 100 sq. km.	- over 270 sq. km.**	0.50
	- over 400 sq. km.	0.33

* This value is likely biased and should be considered as the maximum since it was not possible to determine whether or not several of the failed pairs had laid eggs.

** The actual area used by Kestrels within the total 400 sq. km. area studied.

DISCUSSION

Village (1990) noted three general requisites of a potential Kestrel nest: moderately inaccessible to mammalian predation, reasonably sheltered, and can hold eggs. Further, he notes that the birds show little preference for one site type or another, that they use whatever type of site is available, that anecdotal evidence suggests that local tradition may be important, and that no general trends are shown for sites used.

In this study, pylons with corvid stick nests on them appear however to be preferred sites as in 28 out of 31 instances they were used when available in a given area along with other nest types; They were used even in wooded areas with tall trees with available stick nests present. Pylon sites were used apparently as being of higher quality for hunting small mammals, as also suggested by Henrioux (1995) for Kestrel nest site selection. In certain areas, pylons appear to make up over half the sites available and are the most visible of sites present (amid several large open field areas, for example), though within 500m available stick nests were identified. As Kestrels have successfully used Magpie nests (in 1995) on shrubby trees as low as 2.4 m off the ground, suitable sites are available throughout the cultivated plain. Other behavioural factors may be involved as well.

Differences in productivity between nest sites have been found for the Kestrel only by Hasenclever *et al.* (in Shrubb, 1993); They suggested that productivity was higher in nest boxes than in stick nests due to diminished egg predation by Magpies. However, a reduction of impacts caused by inclement weather would show such changes as well. Riddle (1979), however, found no consistent differences in clutch size or fledging success between different site types in an area where Kestrels used rock ledges and stick nests. Pylon nests here had the lowest overall productivity among the nest types used, though the 20+ m tall 20 kV and 125 kV pylon sites alone were the most productive successful sites. Further, all nests with 5 or 6 young identified (except for one site) were on pylons; nests with 5 or 6 young were only present among the first 40% of the egg laying period (which lasted from March 24-June 4 in 1994).

However, tree sites had the highest productivity per territorial pair; The lower productivity of pylon sites overall was related to nest collapse and a higher failure rate on the lower medium tension pylons, though not significant statistically. Other raptor species nesting on pylons in other studies exhibited similar patterns as well (Gilmer & Wiehe, 1977; Olendorff *et al.*, 1981), though not all studies show such patterns (Ewins, 1994; Meyburg *et al.*, 1995; Poole, 1989), and these pylon sites may even show higher productivity due to lower failure rates than natural sites.

Few problems for Kestrel nesting along these lines have been identified; no power outage events occurred along one medium tension distribution line with four kestrel nests on its pylons and three other nests near it in 1994 (along with many corvid nests), though one fledgling was mortally injured by a wire collision. However, at least three Kestrels were electrocuted due to electrical line infrastructure in one-third of the study area during the period of October 1994-March 1995. Local ENEL maintenance staff remove nests that they believe may cause service interruptions, and could affect Kestrel nest sites or nest availability in the future.

If local anecdotal information is correct, Hooded Crow populations have been increasing and had started to use frequently pylon sites to build their nests 8-10 years ago; Kestrels started to utilize such sites at that time (though Parodi, pers. comm., noted that Kestrels used such sites even 30 years ago in this region). The use of these pylon sites can then be considered as a successful adaption to a human-altered environment.

As for regional variations in Kestrel nest site use, variations found have been typically considered to reflect varying nest site type availability for Kestrels and other raptors (Newton, 1979, 1986; Village, 1990). Shrubb (1993) has shown that nest type use has changed over this century in Great Britain (from stick nests to tree cavities, along with other types of site- buildings, etc.) due to the increase of suitable tree cavities available; however, he also notes recent increase in corvid stick nest availability in Southern England without a concomitant increase in use by Kestrels. Behavioural factors are probably important for nest site selection as has been shown for the American Kestrel (Shutt & Bird, 1985).

The use of pylons for nesting by most species of raptors is in fact typically a local or regional phenomenon (Olendorff *et al.*, 1981), as it also is for the Kestrel. Further research on Kestrel behaviour will be needed to understand their use of pylons as nest sites. In the Friulanin Plain this can be seen as a local phenomenon as well as a preferentially used nest site type.

CONCLUSION

Pylon sites appear to be used successfully by Common Kestrels as preferred sites within the study area. Overall, they are used preferentially where available and other site types are used where they are not. Therefore, pylon sites are not used due to a lack of alternative sites as suggested elsewhere (Anon., 1981; Florit *et al.*, 1993; Parodi, 1987), and such misunderstandings may lead to inappropriate management action for this species (Kenward, 1989). Productivity is similar between nest site types, though the taller electrical line pylons had higher success than all other successful site types. Pylon use appears in general to be a local or regional phenomenon, and is increasing for several falcon species.

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