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Sex-related Differences in Habitat Use in Wintering American Kestrels

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ABSTRACT.—We investigated sex-related differences in habitat use in wintering American Kestrels (*Falco sparverius*) at two scales: within a 10 m radius and within a 100 m radius of perch sites. Female kestrels used areas containing a higher percentage of short vegetation (<0.25 m high) suitable for foraging than did males at both scales (100 m radius females 80%, males 69%; 10 m radius females 80%, males 73%). At both scales, females had more pasture (a high-quality foraging substrate) available than did males; areas within a 100 m radius of male perch sites contained more woodlot than did female perch sites. Logistic regression models indicated greater overlap between male and female habitat use on a 10 m radius scale than on a 100 m radius scale, suggesting that males may preferentially select smaller areas devoid of woody vegetation relative to what is available within 100 m radius of perch sites. Our results suggest that males may be constrained to winter in areas with lower overall foraging opportunities and possibly higher predation risk than areas used by females. Our work supports the hypothesis that males and female kestrels prefer open areas as wintering habitat.

Sex-related differences in habitat use occur in many taxa. Such differences can occur by competitive exclusion (Grubb and Woodrey 1990, Marra and Holberton 1998) or by each sex maintaining separate habitat preferences that result from sex-specific selection pressures (Power 1980, Masman et al. 1988, Bleich et al. 1997). American Kestrels (*Falco sparverius*) show geographic variation in both winter sex ratio and sex-related habitat use (Smallwood 1988, Arnold 1991). Females often are observed in open areas devoid of woody vegetation, whereas males often are observed in semiopen areas that contain some woody vegetation (Koplin 1973, Mills 1975, Smallwood 1987). Open areas used by female kestrels contain a larger proportion of short vegetation suitable for hunting than do semiopen areas used by males, leading some researchers to suggest that open areas are higher in quality to both sexes than are the semiopen areas often used by male kestrels (Mills 1976,

Smallwood 1988). Other researchers contend that sexual habitat segregation is not caused by exclusion but by the maintenance of separate habitat preferences because of higher relative survival and better condition in the habitats where each sex is observed (Koplin 1973, Meyer and Balgooyen 1987).

Experimental and observational studies support the hypothesis that males and females both prefer open areas in the nonbreeding season. In a previous study we experimentally removed wintering kestrels and observed that both males and females use vacant open areas (Ardia and Bildstein 1997). Sex-related differences in habitat use have been reported only in the southern part of the wintering range (below the -7°C minimum winter temperature line, approximately $39^{\circ}50'\text{N}$ latitude; Root 1988) where wintering densities are high (Root 1988), and presumably, competition for preferred sites is also high. Arnold and Martin (1991), working in Ontario (latitude $43^{\circ}19'\text{N}$), observed no differences in habitat use between males and females and hypothesized that low wintering densities (0.13 kestrels- km^{-2}) reduced competition for open areas.

The goal of this study was to test the hypothesis that American Kestrels exhibit sex-related differences in habitat use at an intermediate latitude site (latitude $40^{\circ}55'\text{N}$) in southeastern Pennsylvania. Our study site is just north of the -7°C minimum winter temperature line (minimum temperature -8°C , National Climatic Data Center 1994, 1995) and has a low density of kestrels, 0.14 kestrels- km^{-2} (Ardia 1997). Arnold and Martin (1991) are correct that low densities lead to minimal overlap in habitat use between males and females, we predicted that we would observe no sex-related differences in habitat use, or, at a minimum, that males would be found using more open areas than reported from locations with high densities of kestrels. If the converse is true, then males do maintain a preference for semiopen areas then we would expect to find a clear difference in habitat use between males and females, with males using areas similar to those reported in other studies. As a further test of whether males use open areas, we predicted that if males do prefer open areas in which to forage, but have lower availability within their winter-use areas, then males might be more selective in their foraging locations relative to what is available around perches due to a lower proportion of suitable areas. To assess that possibility, we tested

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