

DISSERTATION ABSTRACT

WINTER ECOLOGY OF URBAN MERLINS (*Falco columbarius*)

A study of a non-migratory Merlin (*Falco columbarius*) population wintering in Saskatoon, Saskatchewan, Canada, was undertaken to examine how individuals cope with thermally stressful environment through behavioral and physiological means and to determine why some members of this urban-breeding population adopted a non-migratory strategy while others remain migratory. Merlins were trapped in the city each winter (1 November–28 February) for 5 years beginning in the winter of 1983–1984. Body mass, wing chord, total length, culmen and tail length were measured for all birds caught, and each individual was marked with a color-coded leg streamer. Selected individuals were fitted with radio-transmitters. Telemetry enabled me to maintain visual contact and continuously record the locations, movements and activities of a focal bird from roost departure until re-entry.

Standard respiratory gas exchange variables of 9 Merlins caught during the study were measured in an open-circuit respirometer to obtain estimates of basal and standard metabolic rates as well as activity costs for alert perch, feeding and preening (flight costs were estimated from allometric equations). Basal metabolic rate was higher in females (6.96 kJ/hr) than males (5.23 kJ/hr), but when placed in a time-energy budget model involving an electrical-analog of heat transfer, activity budget for birds in this population, and detailed meteorological measurements of the birds' habitat and microhabitat, resulted in energy budgets for winter season which did not differ between the sexes (35 908 and 35 487 kJ for female and male Merlins, respectively).

Winter home ranges of adult Merlins were more closely associated with their former nest site than those of yearlings to their natal nest site; adult males were closer to their next breeding site during winter than females. Close association of adult Merlins with former nesting sites is similar to patterns found in other birds. As well as the ability to maintain territory ownership, greater familiarity with the area around the nest may facilitate exploitation of local resources and enhance winter survival. In terms of overall habitat use Merlins showed preference for older residential areas of the city and avoidance of commercial-industrial and rural habitat. However, birds used commercial-industrial habitat for hunting at levels much higher than expected from availability in their home ranges. Hunting activity peaked at 0900 and 1600 H, possibly reflecting the need to replenish energy stores lost during overnight fasting and taking advantage of digestive heat by feeding just before roost re-entry at dusk. Primary prey species for Merlins wintering in Saskatoon were House Sparrow (*Passer domesticus*) and Bohemian Waxwing (*Bombycilla garrulus*), which together comprised 89% of the total number of prey and 92% of the total biomass observed being taken by Merlins in the city.

These data were analyzed in light of a recent northward expansion of Merlin wintering range which includes many towns and cities in the northern Great Plains. Mass-specific metabolism rates for males and females were about 50% higher than expected from allometric calculations; females had reduced lower critical temperatures and males had thermal conductances below expected values. Such cold tolerant physiological capabilities suggest that ecological, rather than physiological, factors formerly limited Merlin abundance on the Great Plains in winter. There were few significant differences in body morphometrics when adults and yearlings or migratory and non-migratory groups were compared. Non-migrant Merlins tended to have non-migrant parents, whereas migratory birds predominantly had migratory parents suggesting a potential genetic component to the development of migratory and non-migratory behaviour. Certain nesting areas in the city were occupied more frequently than others. Birds which wintered in the city nested in these preferred areas more often than would be expected by chance. This suggests that wintering in the city gives non-migratory birds some advantage in being able to obtain higher quality nesting areas. **Warkentin, Ian G., 1988. Ph.D. Dissertation. Department of Biology, University of Saskatchewan, Saskatoon, Saskatchewan S7N 0W0, Canada. Present address: Department of Veterinary Anatomy, University of Saskatchewan, Saskatoon, Saskatchewan S7N 0W0, Canada.**