

During 1980-81 the Spotted Harrier (*Circus assimilis*,) and secondarily, 9 other species of diurnal raptor [the Whistling Kite, Black Kite (*Milvus migrans*,) Brown Goshawk, Peregrine Falcon (*Falco peregrinus*,) Black Falcon (*Falco subniger*,) Brown Falcon, Little Eagle (*Hieraaetus morphnoides*,) Wedge-tailed Eagle (*Aquila audax*) and Australian Kestrel (*Falco cenchroides*)] were studied near Mildura in arid north-western Victoria. In 1980, 19 Spotted Harrier territories were evenly dispersed over the 134 km² study area, but the following year only 2 pairs nested there. In 1980 nest sites averaged 2.8 km apart and territories were about 550 ha. Nests took about 2 weeks to build, incubation periods averaged 33 days and nestling periods 38 days (males) and 42 days (females). A mean clutch size of 3.0 eggs and an average fledging success of 2.2 young per successful nest and 1.3 young per nest site were recorded. Similarly, data were collected on the breeding density, clutch size, nestling periods and breeding success of the 9 other raptor species.

The breeding behaviour of the nomadic Spotted Harriers, from territory establishment to the fledging of their young, was described. Evidence was collected in support of the suggestion that the Spotted Harrier was once a ground-nesting bird like other harriers (*Circus* spp) and that it subsequently became a tree-nester.

It was argued that sexual differences in plumage colour of harriers may best be correlated with their predominant mating system, and not with sexual dimorphism or with hunting and nesting in open country as has been proposed. Data on 6 species of harrier were analyzed to test the above thesis and a previous classification of harriers. A theory on harrier mating systems was proposed. It was suggested that harriers are most often polygynous when optimal nesting habitat is in short supply ("resource defence polygyny"), when food is abundant and perhaps unevenly distributed and when the breeding density of harriers is high.

Rabbits were the main food of 8 of the 10 species of raptor breeding near Mildura, both in terms of numbers eaten (40-75%) and biomass consumed (60-92%). The Starling (*Sturnus vulgaris*,) Stubble Quail (*Coturnix novaezelandiae*) and Galah (*Cacatua roseicapilla*) were the next most important prey species. It was estimated that in 4 months the raptor guild consumed about 14% of the immature Rabbits in the study area.

The breeding behaviour, density and success of Brown Falcons at both Mildura and Werribee were described.

The morphometric and diet data from the thesis were incorporated into a review of current hypotheses proposed to explain the degree of sexual dimorphism in raptors and why females of most raptor species are larger than males.

Baker-Gabb, David John. 1982. Comparative ecology and behaviour of Swamp Harriers *Circus approximans*, Spotted Harriers *C. assimilis* and other raptors in Australia and New Zealand. Ph.D. thesis. Monash University, Melbourne, Australia. 286 pp.

GROWTH AND PRODUCTIVITY OF RED-TAILED HAWKS (*Buteo jamaicensis*) IN SOUTH-CENTRAL KANSAS

Growth and mortality data were collected from 54 nests of Red-tailed Hawks over three nesting seasons. The purpose of the study was to determine how the productivity of Red-tailed Hawks is affected by the type of habitat (cropland, mixed, or pastureland) dominating the habitat within a three-quarter mile radius of the nest. Nestlings were weighed and the length of their tarso-metatarsus (tarsus) measured at intervals of two to eight days. Growth was measured by comparing changes in body weight and tarsal length with age. Asymptote (fledging) values and growth constants were derived by fitting growth curves after the method of Ricklefs and these two measures of growth were compared

statistically. Raw growth data also were compared graphically by inspection. No statistical difference was found in either measure of growth when data were grouped by nesting habitat, year, or size of brood from which young fledged. Visual inspection of graphs of the raw data similarly revealed considerable overlap of measurements with no subgroup departing substantially from any other group. Mortality rates did not differ by year, but were significantly lower in mixed habitats than in cropland and pastureland. Mean size of broods at fledging was significantly larger in 1982 than the preceding two years. Dates of hatching did not differ significantly among years, habitats, or between nests in which one or more young died and nests from which all young fledged. The evidence is used to suggest that Red-tailed Hawks respond to major differences in prey availability according to year (but not by nesting habitat) by adjusting the number of eggs laid. No other reproductive parameter examined, including the growth of the young, is significantly affected by varying levels of prey availability.

Cress, Gary A. 1983. Growth and Productivity of Red-tailed Hawks (*Buteo jamaicensis*) in South-central Kansas. MSc. Thesis, Wichita State University, Department of Biology, 537 Hubbard Hall, Wichita, KS 67208.

MOVEMENTS OF BALD EAGLES ASSOCIATED WITH AUTUMN CONCENTRATIONS IN GLACIER NATIONAL PARK

Movements of Bald Eagles (*Haliaeetus leucocephalus*) associated with autumn concentrations in Glacier National Park were studied during 1979-81. The objectives of the study were to describe movements and habitats used by this group of eagles and to identify a conceptual framework for management of bald eagles and their habitats at the regional level.

Twenty eagles were captured and equipped with radio transmitters at Glacier National Park during autumns 1979 and 1980. Eagles moved south from Glacier through the Flathead and Swan valleys of northwestern Montana. Three eagles remained in these valleys during winter, but most continued south through eastern Idaho. Wintering areas were documented at American Falls Reservoir on the Snake River, Idaho; the Snake River headwaters region of Wyoming, Idaho, and Utah; the Weber River Valley, Utah; the Rush Valley, Utah; the Snake River near Ontario, Oregon; the Carson Valley, Nevada; and the Klamath Basin, Oregon-California. All wintering areas were within the intermountain region. Sightings of additional eagles equipped with colored patagial wing markers at Glacier during autumns 1977-80 fell predominantly (93%) within the intermountain region and were made most frequently in areas used by transmitter-equipped eagles.

In spring, adult eagles followed converging routes from wintering areas to northwestern Montana and continued north along the foothills of the Rocky Mountain through southern Alberta. Near Lesser Slave Lake, Alberta, 2 routes diverged. Some eagles moved north-northeast toward Lake Claire in Wood Buffalo National Park and the east arm of Great Slave Lake, Northwest Territories. Others moved north-northwest toward the west end of Great Slave Lake and Great Bear Lake, N.W.T. Summer ranges were documented at Lake Claire, the Taltson River, N.W.T., Great Slave Lake, and Great Bear Lake.

The most coherent unit for management of bald eagles and their habitats at the regional level appears to be a broad north-south zone, i.e., a flyway. A flyway system that transcends international boundaries seems to offer the greatest potential for long-term conservation of the species.

Young, Leonard Stephen. 1983. Movements of Bald Eagles associated with autumn concentrations in Glacier National Park. M.S. Thesis, University of Montana, Missoula. 102 pp. (Current address: School of Forestry, U. of Montana, Missoula, Mt. 59812)

HAWK MOUNTAIN RESEARCH AWARD

The Hawk Mountain Sanctuary Association is accepting applications for its eighth annual award for raptor research. To apply for the \$500 award, students should submit a description of their research program, a curriculum vita, and 2 letters of recommendation by 30 September 1984, to James J. Brett, Curator, Hawk Mountain Sanctuary, Rt. 2, Kempton, Pennsylvania 19529. The Association's Board of Directors will make a final decision late in 1984. Only students enrolled in a degree-granting institution are eligible. Both undergraduate and graduate students are invited to apply. The award will be granted on the basis of a project's potential to improve understanding of raptor biology and its ultimate relevance to conservation of North American raptor populations.