There were intraspecific differences in pouncing success and hunting bout success. Juvenile harriers were less proficient hunters than adult harriers. In all species hunting success depended on vegetation type hunted. In NH and AK hunting success depended on pounce type.

Variations in temperature, relative humidity, solar radiation, precipitation, and wind velocity were accompanied by shifts in raptor activity.

Numerically small mammals made up the bulk of RLH and NH diets, and in all species but RTH small mammals comprised the majority of the diet by biomass. RTH pirated more prey from other raptors than did the other three species. Adult male harriers took more avian prey than did adult female or unsexed juvenile harriers. The percent of insects in the diet of AK increased with increasing temperatures.

One hundred three interspecific and 69 intraspecific encounters among RTH, RLH, NH, and AK were observed. In 20 percent of the encounters, prey robbery or carcass displacement was attempted. Both RLH and NH were victims of piracy.

While overal species overlaps (α) indicated a similar degree of niche overlap for all four species, RTH, NH, and AK all exhibited at least one overwhelming difference in their niche from the other three species while RLH did not. On the basis of the relative degree of overlap, activity and diet, rather than habitat, were the most important niche dimensions, and time was least important. Weather-related changes in the behavior of the four species resulted in shifts in the diversity of niche parameters that were of the same order of magnitude as interspecific differences in the same parameters. Viewed in their entirety, these data indicate considerably complex resource partitioning among the four species comprising this open-habitat raptor guild.

Bildstein, K. L. 1978. Behavioral ecology of Red-tailed Hawks (*Buteo jamaicensis*), Rough-legged Hawks (*B. lagopus*), Northern Harriers (*Circus cyaneus*), American Kestrels (*Falco sparverius*), and other raptorial birds wintering in south central Ohio. Ph.D. dissertation. The Ohio State University, Columbus. 364 pp.

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ASPECTS OF THE BIOLOGY OF THE AUSTRALASIAN HARRIER (*CIRCUS AERUGINOSUS APPROXIMANS* PEALE 1848)

Abstract

The study is based on 18 months of intensive fieldwork on the southwestern coast of the North Island of New Zealand. During this time 212 Australasian Harriers were trapped, retrapped, measured, sexed, aged, individually marked, and observed. Fortnightly observations of the individually marked population were made over a further seven months. The Australasian Harrier and European Marsh Harrier are considered to be conspecific. Evidence is presented showing that there is no valid reason for considering *Circus aeruginosus* of the Pacific Islands to be a different subspecies from *C. aeruginosus* of Australia and New Zealand. During the breeding season ten terri-

tories in the 12 km² study area averaged 31 ha, nest sites averaged 910 m apart, pairs' overlapping home ranges averaged 9 km², and favourite hunting areas 3 km². A high population density of one bird per 50 ha was calculated. A low fledging success rate of 1.8 young per successful pair and 1.1 young per nest site and two cases of polygyny were recorded during two breeding seasons. Territorial and courtship behaviour, nest parameters, and the parental division of labour are described. Seasonal movements and the dispersion of age and sex classes from the study area at the end of the breeding season are described. Most (66.7%) individually marked adults returned after the autumn dispersal phase and established winter home ranges averaging 9 km². The home range of an adult female in open farmland was calculated to be 14 km² using radiotelemetry techniques. A nonbreeding season population density of one bird per 80 ha was calculated. Communal roosting, which occurred throughout the year, is discussed. Four hundred and seventy food items were identified in the diet from pellets, prey remains, stomach contents, and field observations. In descending order of numerical importance in the diet were mammals (46.4%), introduced passerines (29.0%), insects (7.6%), game birds (6.7%), birds' eggs (4.8%), and aquatic prey (4.6%). Australasian Harriers ate significantly greater numbers of live prey than carrion annually. Adults took significantly greater numbers of agile food items than juveniles. Females ate significantly more large (⁴200 g) and fewer agile food items than did males. Seven search techniques and five attack techniques, including some buteonine techniques, are identified and described in the Australasian Harriers' wide range of hunting techniques. Ninety-five attacks on prey are recorded, and 15.8% of them were successful. Adults were significantly more successful hunters than juveniles. Cooperative hunting, hunting in the daily cycle, feeding behaviour at carrion, interspecific competition for carrion, interspecific disruption of hunting, and prey escape tactics are described. From a computer analysis of hunting behaviour data it is concluded that adult males are more maneuverable and less conspicuous than adult females and juveniles because they flew significantly lower and faster. Adult males also hunted, to a significantly greater degree, those habitats where there were greater numbers of agile prey. The hunting inexperience of juveniles was quantified. The Australasian Harrier is moderately sexually dimorphic. Current hypotheses proposed to explain the degree of sexual dimorphism in raptors and why the females of most raptor species are larger than males are critically reviewed.

Baker-Gabb, David J. 1978. Aspects of the biology of the Australasian Harrier (*Circus aeruginosus approximans* Peale 1848). M.Sc. thesis, Massey University, Palmerston North, New Zealand. 221 pp.

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BEHAVIORAL AND PREDATORY DYNAMICS OF AMERICAN KESTRELS WINTERING IN THE ARCATA BOTTOMS

A field study of American Kestrels (*Falco sparverius*) was conducted in the Arcata Bottoms, Humboldt County, California, during the winters of 1972–73 and 1973–74,