bilities for future study by graduate students and others who love our night-time friends.

Johnsgard's exquisite sketches, 10 coloured paintings of owls by Louis Agassiz Fuertes, and 31 fine colour photographs, including nine of Mexican owls, make this an unusually attractive book. Buy it!

MARTEN J. STOFFEL

Box 183, RR#4, Saskatoon, Saskatchewan S7K 3J7 Canada

The Mountain White-Crowned Sparrow: Migration and Reproduction at High Altitude

By Martin L. Morton. 2002. Studies in Avian Biology Number 24. Cooper Ornithological Society, Camarillo, California. 236 pages, 8 colour plates, pencil illustrations heading each chapter. U.S.$27.

The northern limit of the distribution of the Mountain White-Crowned Sparrow (*Zonotrichia leucophrys oriantha*) extends slightly into southern British Columbia, Alberta and Saskatchewan. Its main breeding range is in mountainous regions of the western U.S. Here in Waterton Lakes National Park we're at the contact zone between *oriantha* and *Z. l. gambelii*.

Morton's 25-year study of *oriantha* in the Tioga Pass area of California's Sierra Nevada ranks with P. J. Greenwood's lengthy study of the Great Tit (*Parus major*) in Europe and G. E. Woofenden's work with the Florida Scrub Jay (*Aphelocoma coerulescens*) in showing the value of continuous long-term field investigations in advancing a broad spectrum of ideas and hypotheses in avian biology. Morton's focus is different, however, in emphasizing physiology more than behaviour or ecology. In 1968, Morton recognized that there were significant gaps in knowledge of migratory passerines on their summering grounds, especially in mountains where large variations in environmental conditions occur.

As my interests lie more with natural history, life history data (age at maturity, number, size and sex ratio of offspring, dispersal and survival rates) and ecological factors than with physiology, I found Morton's first three chapters on Migration Arrival, Social System and Behavior, and Demography of most interest (although a bit disappointing at only one-quarter of the book's pages). The dynamics of arrival of *oriantha* varied greatly from year-to-year depending upon the amount of remaining snowpack and the frequency of spring storms, as well as by age and sex. By trapping and colour-marking individuals, the researchers found that older males (age 2+ years) generally arrive earliest, followed by one-year-old males, older females and one-year-old females. Throughout the monograph, Morton does an excellent job of analysing observed data in terms of costs and benefits, and ecological factors, in this case, suggesting that older, experienced birds knew the migration route and recognized the breeding area once they reached it, even it if was snow-covered.

Morton's efforts over many reproductive seasons made it possible to measure mate fidelity, age of mates, frequency of polygamous pairings, agressive behaviours, and the functions of vocalizations, in addition to the usual study of territory establishment, pairing, and between-year breeding dispersal.

Although I expected the chapters on Gonadal Condition, and Body Size and Body Condition, to be of less personal interest, Morton's explanations of the connections between physiology and behaviour, and description of the role of environmental cues in annual cycles made these sections much more interesting than anticipated. Environmental factors are either ultimate (e.g., availability of an adequate food supply, predation pressure, weather patterns) or proximate (e.g., photoperiod, ambient temperature) in their effects on the timing of reproduction.

Nest history (chapters 7, 8, 9 and 10 on Nests and Eggs, Nestlings and Fledglings, Nest Failure and Reproductive Success, respectively) provided reliable information on physiological and behavioural responses of breeding birds to environmental variation, often to the level of individuals because of Morton's use of marked birds. And the researchers determined that the snowpack, because of its effects on nesting schedules and nest locations, was a stronger environmental factor on reproductive success than sub-freezing temperatures or summer storms. *Oriantha* exhibited plasticity in responding to snow conditions by abandoning ground-nesting and building their nests in elevated sites when there was more snow, as opposed to Hermit Thrushes (*Catharus guttatus*) or Dark-eyed Juncos (*Junco hyemalis*), which nested on the ground no matter what the environmental conditions.

Morton's study shows that challenges posed by environmental variation often can be met with existing behavioural and physiological responses; adaptation occurs through flexibility rather than through acquisition of new abilities or mechanisms.

CYNDI M. SMITH

Box 5, Waterton Park, Alberta T0K 2M0 Canada