

cent of its historic numbers. In a few areas of contact with its larger relative, the Greater Prairie-Chicken, some hybridization occurs.

The Greater Prairie-Chicken vanished from Tennessee by 1850, Kentucky by 1874, Arkansas by 1913, Ohio by 1934, and Michigan by 1983. Hunting seasons were closed permanently in Missouri in 1907, Colorado in 1937, Minnesota in 1943, North Dakota in 1946, Wisconsin in 1956, and Oklahoma in 1998. The last known nesting in Iowa was in 1952, but after reintroduction attempts there are now 44 males on six booming grounds. In Kansas, Nebraska and South Dakota, populations remain large enough to permit an annual hunting season, but even in these three states the area occupied has decreased drastically.

The *attwateri* subspecies once may have numbered 100 000 birds when it occupied six million acres of Gulf Coast prairies, mainly in southeastern Texas. Now that predators take 53 per cent of nests, brood survival to eight weeks is 34 per cent, and adult annual survival rates vary from 11 to 36 per cent, the population has dropped to about 45 birds. This race appears to be doomed.

The Greater Sage-Grouse, specifically adapted to sagebrush, has dropped from a population of near 2 million in 1950 to about 200 000 in 2000, and it has been extirpated from Nebraska, Oklahoma, New Mexico, and Arizona. In the late 1970s it was still being shot by hunters at the rate of 83 000 per year in Wyoming alone. In Saskatchewan, the population dropped by up to 92 per cent between 1970 and 2000.

In 2000, when the Gunnison Sage-Grouse was named a new species, *Centrocercus minimus*, it occupied only a small portion of its former range in southwest Colorado and adjacent Utah. Fewer than 5000 adults remained. Johnsgard notes that this new species, due to the "glacial rate of movement of the federal legal process ... might well be endangered before [it is] officially recognized as threatened, and extinct before [it is] classified as endangered."

Crows: Encounters with the Wise Guys

By Candace Savage. 2005. Greystone Books #201-2323 Quebec Street, Vancouver, British Columbia V5T 4S7 Canada. 113 pages. \$27 Cloth.

Several years ago I overheard a person say "He must have been slow to volunteer. He's got stuck with crows." They were talking about me. I had actually been one of the first to volunteer to write sections of the original Ontario breeding bird atlas and I had deliberately asked for crows as my assignment. Why do people think of these birds as common, black and noisy, and therefore dull?

I have always found crows to be entertaining, clever and well worth watching. It is comforting to know there

Finally, two of the three grassland subspecies of the Sharp-tailed Grouse have shown drastic decreases in range, including a loss of 90% of the range of *T. p. campestris* in Wisconsin and Michigan and 60% in Minnesota, even though their habitat has changed less than that of any other grassland grouse species. In the far west, an even more drastic loss of range (92%) has occurred for *T. p. columbianus*. Since 1998 it has been listed as threatened in the state of Washington; satisfactory populations survive only in British Columbia.

The greatest strength of this book is the detailed maps of past and current ranges of each race. Descriptions of the mating rituals of each race are especially well done. I have minor criticisms. Coverage is less detailed for all grassland grouse in the Canadian provinces; Johnsgard fails to state conclusively that the Greater Prairie-Chicken is officially considered to be extirpated from Canada, and that the recovery team for this species was disbanded in 1994. It is not true that hybridization between Greater Sage-Grouse and Sharp-tailed Grouse occurs only in eastern Montana and eastern Wyoming; it has also been reported from extreme southern Saskatchewan. The disruptive effect of Ring-necked Pheasant cocks at Greater Prairie-Chicken leks is barely mentioned.

The final chapter asks, "Can the fabric be mended?" For some races of grassland grouse, the Greater Sage-Grouse in Canada, the Lesser Prairie-Chicken and the *attwateri* race of the Greater Prairie-Chicken in the United States, it may already be too late. "As agriculture became more mechanized and the farms larger, fewer and fewer acres were spared from increasingly effective pesticides and herbicides ... the prairie grouse began a long, slow, but certain descent into oblivion."

No one knows what the future holds, but Johnsgard certainly has raised the alarm call.

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is at least one person who shares my enthusiasm for these wonderful birds. Candace Savage has collected tales and myths about the crows of our world. For the crow fan this is delightful reading. For the crow-deficient minds of others this book will offer enlightenment.

The author has sifted through both archaic stories and modern research on the black crows (the gaudy jays do not get mentioned). She covers the biology, social structure and interactions, communications and tool-use to try and answer the key question. Are crows intelligent? Crows have been observed by many of us doing things that suggest they have mentally resolved a problem. The difficulty is their behaviour can be explained in other ways. The research that Savage

references is generally aimed at giving a crow a test that should prove or disprove intelligence. This is an elusive goal and I am not convinced that crow intelligence is proven. However, the results are so amazing that it is impossible to deny that crows behave intelligently. In some ways they are surprisingly similar to humans.

Antipredator Defenses in Birds and Mammals

By Tim Caro. 2005. The University of Chicago Press, Chicago 60637. xv + 591 pages. U.S. \$95.00 Cloth. \$38.00 Paper.

Recently I read a report of Merlins hunting migrant chickadees as they flew out from a point along Lake Ontario. The falcons were capturing and eating the chickadees on the wing, and it made me ponder how defenseless the birds seemed, and the contrast with the shorebirds that Merlins are normally hunting in this location. To those of us who watch birds such events can often seem exciting and dramatic interludes in the birds' more usual activities, such as feeding. As such, they have generated over the years a host of anecdotal notes of the type above. But of course, defenses against predators are absolutely basic to an animal's life: without them there would be no feeding, or anything else. So the challenges of avoiding predation have become a fertile field of investigation.

Which brings me, finally, to this book, in which Tim Caro examines the bewildering range of mechanisms and strategies that enable mammals and birds to evade capture and death from the wide variety of predators that most animals face. Such is the multiplicity of all of these – prey species, defenses and predators – that any synthesis is daunting, yet Caro does a masterly job of mustering the relevant data from a huge and growing field, and rendering it into a coherent and lucid whole. The 87 pages of references alone attest to the encyclopedic character of the undertaking.

The book is divided into 13 chapters, with the first devoted largely to setting the stage, followed by 11 that trace the “predatory sequence” from traits that avoid detection, such as cryptic coloration, and behavioral mechanisms to avoid detection, through vigilance and prey signaling [both warning and of unprofitability], the benefits of grouping, and then physiological and morphological defenses, such as body size, quills, spines, antlers and the like. There is a chapter on nest defense, and one on mobbing and other group defenses, with chapter 12 devoted to “behaviors of last resort”. Taken together, these provide a comprehensive overview of predator avoidance, with copious references to the literature, and tables and figures from relevant papers providing a useful complement to the text.

This is an ideal gift book. It is fun to get and read, but not the sort of book you normally buy for yourself.

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Caro's formidable command of his subject is apparent throughout.

The thing that impressed me most about the book is its clarity. As a generalist with no more than a broad interest in the field, I had some trepidation about undertaking this review. The subject is, after all, at this level a technical one, and technical treatises can be relatively incomprehensible to the non-specialist. I need not have worried. While hardly light bedside reading, the entire text has a refreshing clarity and readability. From the preface onwards Caro clearly states what he is going to do, with the reasons why, and provides the appropriate references to those allied aspects of the field that he chooses not to cover. Then in each chapter he again defines the area he will cover, discusses it critically with copious examples, noting the weaknesses in our current understandings, and then provides a concise summary at the end.

Chapter 13, framing questions about antipredator defenses, brings the disparate threads of the previous chapters together, and focuses in on ten “pressing questions” which the author sees as particularly important at this time.

An appendix gives the scientific names of vertebrates mentioned, and each chapter has a delightful sketch of some aspect of animal behaviour that is appropriate to the text that follows. All the references that I checked were accurate, and the book is agreeably free of typographical mistakes. I am less enthusiastic about the indices, which are divided into “prey species index” and “subject index”, and the former is further subdivided within the index itself. I've never been able to comprehend the rationale for split indices, but these seem adequate, if irritating.

This book is a major contribution to the literature on this subject. It is a “must” for anyone working in this or allied fields, an important reference text, and a comprehensive, stimulating and thought-provoking synthesis of a very important area of animal behaviour.

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