

have been changed to those used in the latest *Check List of North American Birds* by the American Ornithologists Union. The individual accounts cover status, a brief description, breeding (if appropriate), range, and remarks. For vagrant species this is generally reduced to comments on status and remarks only. All the text has been thoroughly revised to bring the book up to date. It is clearly and concisely written yet still retains the maritime flavour of the original author.

Any bird which has been sighted less than ten times is treated as a vagrant. For these birds, details are given from all of the records. Nova Scotia, because of its maritime position, has had more than its fair share of these rarities. The accounts give a satisfying amount of detail and yet the text is written skillfully enough not to be cumbersome.

The remaining migrant and nesting species are given a more expansive treatment. But once again this is not done in a ponderous and rambling fashion. It is remarkable to note how many species have a status that is less than common. This confirms my own experience as I found the "common" birds were much less abundant and harder to find in Atlantic than in Central Canada. However, what Nova Scotia lacks in numbers it makes up in diversity. This can all be gleaned by carefully reading this book.

There are two appendices. Appendix I covers hypothetical species for which no satisfactory supporting evidence exists. Appendix II lists five game birds for which unsuccessful attempts at introduction have been made.

I have only one minor note of criticism. The book contains an excellent map of Nova Scotia (although Ile Madame's coastline is misprinted). However, many of the important places mentioned in the text are not marked (such as Bird Islands, Cherry Hill Beach, etc.). The addition of these names would have been useful and would not have cluttered the map unduly.

I think that Ian McLaren and his team from the Nova Scotia Bird Society must be congratulated on their excellent efforts. Not only have they put a valuable and informative book back in circulation, they have enhanced its usefulness substantially. For the caliber of document produced, the price of \$19.95 makes it an excellent purchase.

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Honeybee Ecology: A Study of Adaptation in Social Life

By Thomas D. Seeley. 1985. Monographs in Behavior and Ecology. Princeton University Press, Princeton, New Jersey. x + 201 pp., illus. Cloth U.S. \$39.50; paper U.S. \$10.50.

Of all the insects, the honeybee is the most well understood by scientists and lay persons alike. Honeybees fascinate us all, no matter what our ages. Children and adults alike may become so engrossed when they watch the hubbub of activity within a glass-walled observation hive that all else is forgotten. There, the challenge to pick out the queen and her retinue of attendant workers, to distinguish the drones, to observe the ministrations of the workers to them, and to observe the incoming foraging worker bees unload their burdens of nectar or pollen and dance their elaborate communication language, all become absorbing. Finding eggs, at the bottom of the cells of the comb, seeing the larvae in various sizes, imagining what it must feel like to be a pupa in a capped-over cell, and struggling along with an emerging adult worker bee as she breaks free of her confining cell, bring out the pleasures of keen observation. Our knowledge that the bees are foraging at flowers for nectar that they will convert to honey

certainly adds to our appreciation of these insects and was, no doubt, the reason for their being domesticated thousands of years ago, their painful stings notwithstanding.

This book is a scholarly treatise on honeybees. Seeley explains the lifestyle, behaviour, and sociobiology of honeybees in the modern framework of evolutionary ecology. He accomplishes this well by drawing on the wealth of literature in apiculture. Much of that has been published in the basic scientific literature, but a large body of information resides in publications devoted to applied biology, especially in agriculture. Seeley has expertly combined both.

Most of the book is about the "European honeybee", *Apis mellifera*, of which several races are commonly domesticated. That bias, which leads to some over-generalizations in the book, is unavoidable because comparatively little is known about the African and Middle-Eastern races of *A. mellifera* or about the Asiatic honeybees, *A. dorsata* (the giant or rock bee of tropical Asia), *A. florea* (the dwarf honeybee), and *A. cerana* (the Asiatic hive bee which is most similar to *A. mellifera* in anatomy and behaviour). Nevertheless, many of the basic general

principles that Seeley elucidates apply to all species and races and at the same time provide, in their detail, interesting comparisons.

Seeley's explanations of social cooperation within honeybee colonies are generally clear. However, such cooperation comes about not without sacrifice in the colony, and its interplay with compromise and conflict at chemical (pheromone) and physical levels provide fascinating insights into sociobiology and the evolution of sociality in insects and other animals. Unfortunately, Seeley catapults his readers into the theories of kin structure, relatedness, altruism, sex ratios, and investment ratio in producing queens and drones, and life history traits. The theories are not adequately explained and Seeley may well mystify some of his readers in the algebra of parts of Chapters 3 and 5.

The lucid descriptions of the annual cycle of colonies of *A. mellifera* in a temperate setting, of colony reproduction and swarming, of the construction of nests, foraging, and the dance language, and of the economics of foraging (which honeybees do for a profit, e.g. honey) more than make up for the problems noted above. Seeley details the precision by

which honeybees control the temperature within their nests, both summer and winter, citing that ability as one of the major innovations made possible by the evolution of their societies. Colony defense is not just accomplished by stinging, altruistic workers, but also by the fastidious cleaning activities in the hive (the removal of corpses, diseased individuals, and outdoor defecation) and the use of plant gums (propolis) as a sticky ant-guard by *A. florea*, or for waterproofing and sealing the nest by races of *A. mellifera* in temperate climes. These facets of the lives of honeybees are described in highly readable detail.

Honeybee Ecology is a splendid synthetic accomplishment. It places some of the recent advances in ecology, sociobiology, and evolution in the context of the biology of an insect with which everyone is familiar. For those reasons I recommend the book to general readers who are interested in ecology, as well as to specialists in behaviour and honeybee science.

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Predator-Prey Relationships: Perspectives and Approaches from the Study of Lower Vertebrates

Edited by M. E. Feder and G. V. Lauder. 1986. University of Chicago Press, Chicago. 198 pp., illus. Cloth U.S. \$26.00; paper U.S. \$11.95.

Much of zoology has been dominated by data based on furry, feathered, or six-legged animals. Based on a symposium, the present volume outlines the benefits for a general understanding of predation to be derived from directing attention to "lower" vertebrates. Predation is a huge topic, of concern to anatomists, physiologists, behaviourists, geneticists, ecologists, and evolutionary zoologists. For all of those interested in these fields, the editors hope to publicize recent research with these animals and to promote interdisciplinary integration. They have successfully encouraged their contributors to downplay detailed data and instead emphasize critical evaluation and speculation.

The nine authors are leading workers who appropriately span the broad spectrum at hand. C. Gans reviews how functional morphology underpins much work on predation, and offers the example of the jaw musculature of skinks. In his chapter on locomotion, P. W. Webb illustrates the route by which descriptive studies lead to tests of predictions of behaviour based on biomechanical principles. Discussing neural mechanisms of prey recognition in amphibia, G. Roth indicates the value of neuroethol-

ogy in predation studies. He argues for a "recognition module" concept in place of the earlier idea of feature detectors, and elegantly outlines the sensorimotor integration underlying feeding sequences. One of his salamanders with its projectile tongue launched against insect prey provides the impressive frontispiece for the book. Energy as a primary medium of biological exchange, and difficulties with its measurement in unrestrained animals, are considered by A. F. Bennett. Turning to the active area of comparisons between species, R. B. Huey and Bennett review the advantages and limitations of descriptive comparisons, and the importance of a phylogenetic perspective for a suite of ecological, mechanistic, and evolutionary questions. They examine issues, such as the use of cladistic analysis, with the case of Kalahari lacertid lizards. H. Greene presents a plea for more study of the natural history of animals as the basis for evolutionary biology, while S. J. Arnold investigates the population genetics of adaptation in terms of variation, selection, ontogeny, and inheritance with comparisons between laboratory and field findings in garter snakes. Defences of each stage of the behavioural sequence of predation are presented by J. Endler, with an example from vision in fish. G. S. Helfman deals with the behaviour of prey fish as a set of conflicts between avoidance of predators and other activities such as reproduction



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