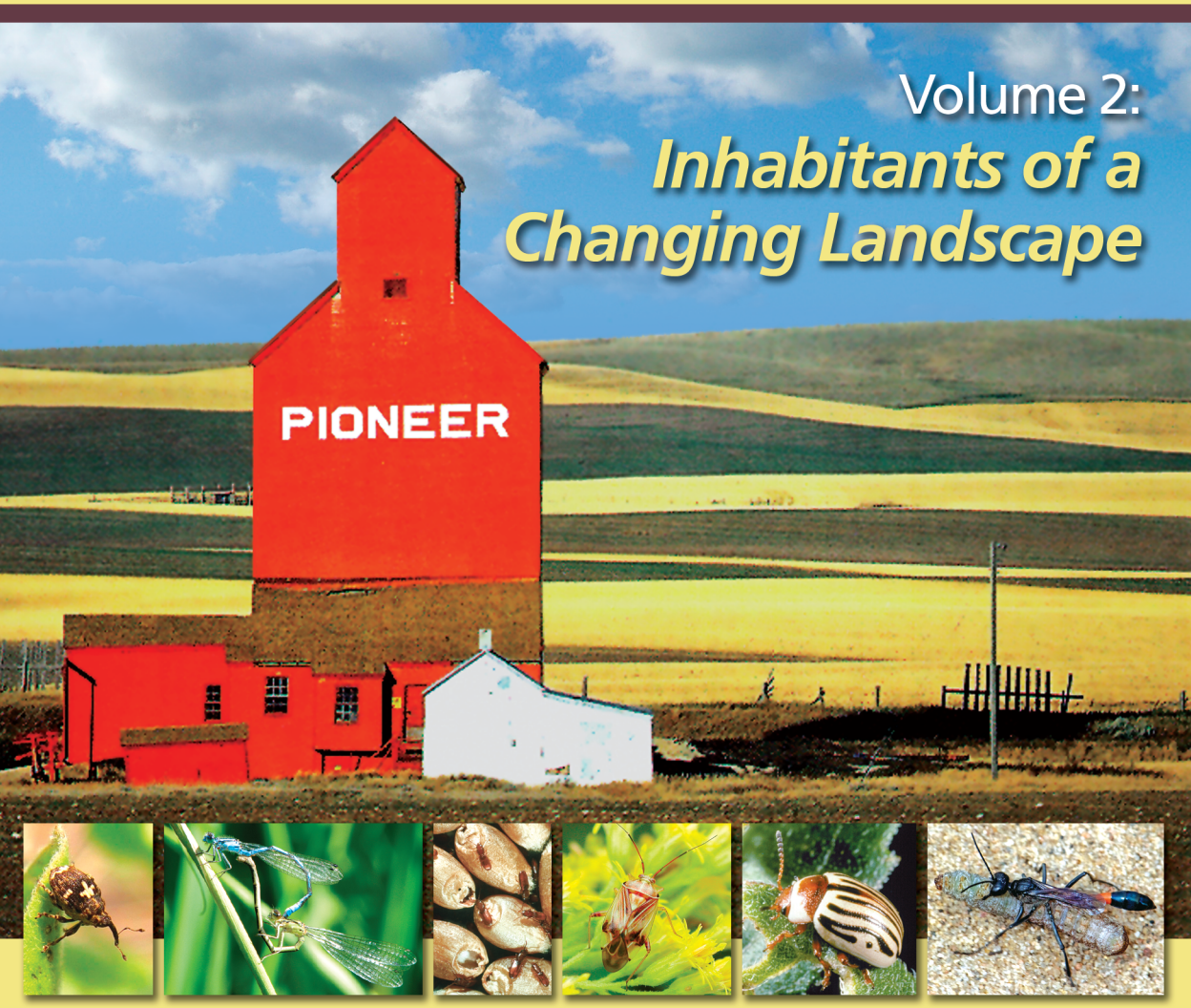
Arthropods of Canadian Grasslands

Volume 2: *Inhabitants of a Changing Landscape*



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Biological Survey of Canada
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Arthropods of Canadian Grasslands (Volume 2): Inhabitants of a Changing Landscape

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Preface

The Biological Survey of Canada (Terrestrial Arthropods) is a not-for-profit national organization that was established in 1977 to coordinate research on Canada's arthropod fauna (http://www.biology.ualberta.ca/bsc/bschome.htm). Several years ago, it began a project to highlight the arthropods (insects, spiders, mites and their close relatives) of Canada's grasslands. The first book in this series, *Arthropods of Canadian Grasslands (Volume 1): Ecology and Interactions in Grasslands Habitats*, was published in 2010 and is freely available online at: http://www.biology.ualberta.ca/bsc/english/grasslandsbook.htm. It reviews the attributes of Canada's natural grasslands and grassland ecosystems with an emphasis on native species. However, most of Canada's grasslands have been converted to pastures and agroecosystems for livestock and crop production. The current volume examines these modified grasslands and their arthropod inhabitants in more detail with greater emphasis on introduced species, for which most information is often available.

As with Volume 1, Volume 2 of *Arthropods of Canadian Grasslands* deliberately targets a broad audience that includes post-secondary students, but also teachers, farmers, ranchers and naturalists. To increase the appeal of the series, authors were encouraged to liberally illustrate their chapters with photographs and images, and to present content in an 'easily digestible' manner. There remains, however, considerable variation among chapters, reflecting their contributors' expertise and interests.

Volume 2 contains 13 chapters loosely organized in three sections. The first section examines arthropods of relatively unmodified habitats, but begins with an overview of the anthropomorphic changes made to native grasslands since European settlement to provide a historical context (Chapter 1 - Willms, Adams & McKenzie). Chapter 2 (Acorn) reviews the formation and features of sand hill habitats and their characteristic arthropod fauna. Chapter 3 (Lysyk) examines the biology of arthropods associated with livestock on pastures. Chapter 4 (Floate) continues this theme with an overview on the diversity and ecology of arthropods that breed in cattle dung. Chapter 5 (Wrubleski & Ross) examines the arthropod taxa of prairie wetlands (potholes, marshes, sloughs) and how anthropomorphic activities affect wetland biodiversity and function. Chapter 6 (Miyazaki & Lehmkuhl) reports on the biodiversity of aquatic arthropods in the Saskatchewan River system in Saskatchewan with an emphasis on mayflies, stoneflies, caddisflies and chironomids.

The next section examines arthropods of greatly modified habitats. Chapter 7 (Charlet & Gavloski) reviews the arthropods of native and cultivated sunflowers in the Northern Great Plains. Chapter 8 (Gavloski, Cárcamo & Dosdall) provides similar information for oilseed crops (canola, mustard, flax). Chapters 9 (Gavloski & Meers) and 10 (Soroka & Otani) review the arthropod assemblages of cereal and legume forage crops, respectively. Chapter 11 (White, Fields, Demianyk, Timlick & Jayas) summarizes the ecology of arthropods that inhabit bulk storage facilities for cereal and oilseed crops.

The final section contains only two chapters. Chapter 12 (De Clerck-Floate & Cárcamo) examines the deliberate introduction of arthropod species into grasslands and agroecosystems as biological control agents for weeds and pestiferous arthropods. Chapter 13 (Hall, Catling & Lafontaine) concludes the volume with an overview on the legislation and organizations that exists to protect grassland arthropods.

Publication of *Arthropods of Canadian Grasslands* is intended to increase awareness of this vanishing habitat and its associated arthropods. As little as 6 percent of Canada's prairie grasslands remain undisturbed by human activities and, for all intents and purposes, cannot be restored. With rare exception (e.g., Grasslands National Park), the remaining parcels are

partially to completely unprotected, and are under continuous threat of agricultural activity and resource extraction. Consider the following two examples.

Covering 2,960 km^2, Canadian Forces Base Suffield is one of the largest remaining blocks of relatively undisturbed grassland in the country, albeit with over 14,000 oil wells and associated pipelines and roads. In 2003, an area of 458 km^2 with about 1,150 oil wells was formally designated as the Suffield National Wildlife Area (SNWA) to ensure that the SNWA is maintained as federally protected and managed native wildlife habitat. Two years later, a private oil company submitted a proposal to drill up to 1,275 additional oil wells in the SNWA and install pipelines to connect the wells to existing and new infrastructure.

"Potatogate" provides a more recent example. In September of 2010, details were leaked of a proposal quietly being considered by the Alberta government to sell 16,000 acres (25 sections) of native grassland near Bow Island, Alberta, for conversion to potato fields. Despite its designation as "public land" and its status as habitat for several species of endangered birds, reptiles and plants, no public input was solicited. The proposal was subsequently withdrawn following the resultant outcry by private individuals and conservation groups. However, the land is no more protected now than it was then.

If *Arthropods of Canadian Grasslands* helps in the efforts to conserve our native grasslands and their unique biodiversity for the education and enjoyment of future generations, it will have served its purpose.

Kevin D. Floate
Lethbridge, Alberta

Dedication to Geoffrey G. E. Scudder, George E. Ball and Hugh V. Danks

On behalf of all entomologists associated with the Biological Survey of Canada (Terrestrial Arthropods) over the past 35 years, and more recently those associated with the grasslands project, this volume is dedicated to three pillars of the Canadian entomological community in Canada: Drs. Geoffrey G. E. Scudder, George E. Ball, and Hugh V. Danks. All three have made outstanding contributions to the science of entomology in Canada, to the education of several generations of entomologists and to the administration and success of the Biological Survey of Canada. They were, and still are, deeply respected as scientists, educators, and humanitarians across Canada and around the world. All three are enthusiastic, unassuming, kind and private men, with a relentless support of biological causes, especially the need for biological collections and their value to science. All three have been recognized nationally and internationally for their excellence. Each was awarded the Entomological Society of Canada's Gold Medal, the highest award of the Society in recognition of their serving the entomological community with distinction; Geoff Scudder in 1975, George Ball in 1980, and Hugh Danks in 2003. Each was also awarded a Fellowship in the Entomological Society of Canada, Geoff Scudder and George Ball in 1975 and Hugh Danks in 1982.

Geoff Scudder and George Ball spent their entire careers as academics at two of Canada's universities best known for excellence in teaching and research. Hugh Danks spent most of his career as Head of the Biological Survey of Canada (BSC), a national organization based at the Canadian Museum of Nature. All three honourees are known for their organization and leadership skills, Geoff being the Head of the Department of Zoology at the University of British Columbia from 1976 to 1991, and George being the Head of the Department of Entomology at the University of Alberta from 1973-1978 and 1979-1984. Hugh nurtured the BSC from its inception in 1977 to the productive and internationally recognized organization it is today. All three were Presidents of the Entomological Society of Canada: Geoff Scudder in 1986-87, George Ball in 1982-83, and Hugh Danks in 1997-98, and all served on many of its committees. They were fixtures at provincial, national and international conferences where they actively engaged in conversation with students and colleagues. All three are now retired with Geoff and George Professor Emeritus at their respective universities.

Of all their many contributions to entomology, the one we honour here is their association with the BSC. The Survey was started as a Pilot Study for a biological survey of Canada's insects, an idea proposed by the Entomological Society of Canada in 1974. After a series of contracts, including one primarily for production of a book about the insects of the arctic, the Survey was established in 1980 at the Canadian Museum of Nature (at that time called the National Museum of Natural Sciences), which provided financial support under a continuing partnership with the Entomological Society of Canada.

The Biological Survey of Canada was designed to coordinate the collection and dissemination of information on the biodiversity of insects and related arthropods in Canada with respect to faunal composition and history, systematics, distribution, ecological attributes and the ways insects are affected by the activities of humans. The Survey was run by a small secretariat at the Canadian Museum of Nature with Hugh Danks as the Head from 1977 until his retirement in 2007, and with a secretary, Margaret Ridewood for many years initially, and Susan Goods more recently. The BSC operated through a Scientific

Committee comprised of about 20 entomologists, established by the Entomological Society of Canada, from across the country who met in Ottawa twice a year to provide advice to the Secretariat, monitor ongoing projects in biodiversity and initiate new ones, from a national scientific standpoint. Geoff Scudder and George Ball attended nearly all of these meetings from 1977 to 2009. George was the Chair of the Scientific Committee from 1977-1979 and from 1986-1995 and Geoff was the Chair from 1979-1986. Geoff and George were among the most active participants at these meetings impressing committee members with their intellect, encyclopedic knowledge of Canadian fauna, and organizational skills. Hugh contributed many ideas about the Survey's projects as well as how to deliver their results. He was the epitome of a meeting organizer, having the uncanny ability to plan an agenda for a two-day meeting that would end within 5 minutes of the scheduled adjournment on day two, after providing everyone present ample opportunity to present and debate their views!

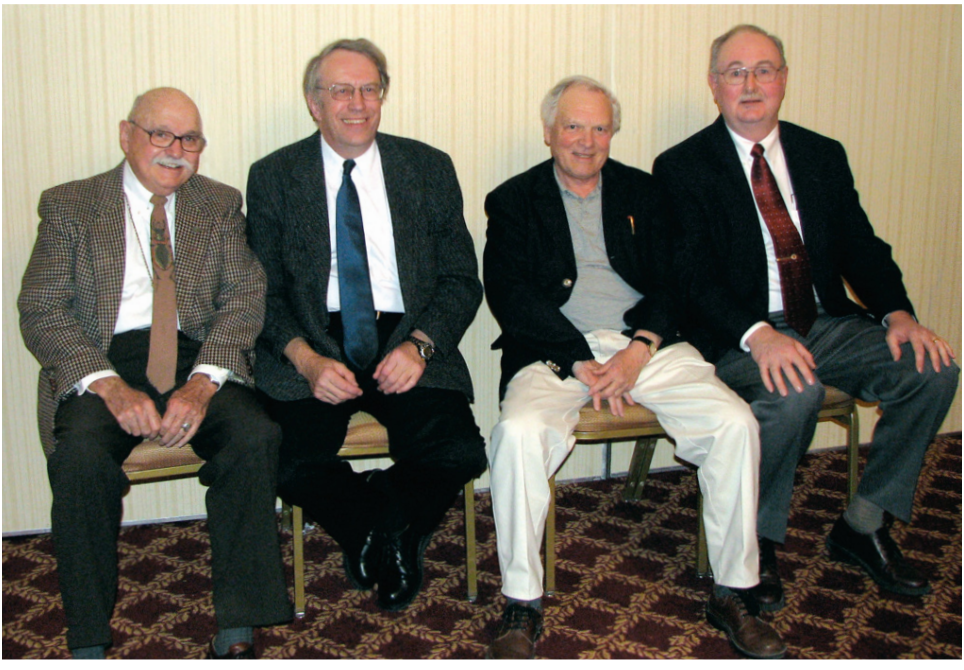
Geoffrey Scudder completed his D.Phil. at Oxford University in 1958 at the age of 24 and began his teaching career at the University of British Columbia the same year. He mainly studied insects of the Order Hemiptera throughout his career with an emphasis on the systematics, taxonomy, ecology, zoogeography, and evolution of the world Lygaeidae (sensu lat.), as well as the aquatic bugs, Pentatomoidea and Miridae of Canada. He has published more than 230 papers, edited three books and written many book chapters.

He has travelled the world studying seed bugs and has visited most major world museums to study specimens. Geoff taught entomology, along with many other courses, at the University of British Columbia for over forty years until his retirement in 1999. He is the only faculty member at the University of British Columbia to win all four of the highest honours the university can bestow; the Master Teacher Award, the Killam Research Prize, the President's Service Award for Excellence, and the UBC Alumni Faculty Citation Award. Throughout his career he inspired thousands of undergraduate students and contributed to the training of well over one hundred graduate students. In the year of his retirement, an endowment was created to honour his contributions by funding an annual lecture by a prominent entomologist.

Geoff Scudder's work ethic is legendary. All members of the BSC will recall finding him working late at night, after a day-long meeting or a long flight east, identifying bugs in the Canadian National Collection of Insects, then returning to his hotel room to mark papers or work on grant proposals or manuscripts for most of the night. Geoff has always loved the open range of the dry interior of British Columbia, especially near Osoyoos where he owns a home that he uses as a laboratory. Despite periodic bouts with ill health, he continues to astound all who know him with his energy.

In his latter years, the conservation of biodiversity has become a driving force in his research and political action. Since the late 1980s, he has helped document rare and potentially threatened species and habitats in the grasslands of the southern Okanagan giving him the scientific credibility to push for conservation measures. He has become outspoken on these issues and has not been adverse to convincing politicians and bureaucrats to change their policies. The culmination of his national work on biodiversity science, conservation and the protection of species at risk was his appointment to the Order of Canada in 2002.

George Ball did his Ph. D. at Cornell University and took up his position as professor of entomology at the University of Alberta in 1954, retiring in 1992. He led a distinguished career as an educator, curator, and scientist, studying New World carabid ground beetles covering all fields from systematics, faunal inventories, to zoogeography, evolution and



From left to right, George E. Ball, Hugh V. Danks, Geoffrey G. E. Scudder, and Joseph D. Shorthouse in April, 2007. Ball, Scudder and Shorthouse were each Chair of the Scientific Committee of the Biological Survey of Canada for many years from 1977 to 2008. Danks was the Head of the Biological Survey of Canada from 1977 to 2007. Photograph by Donna Giberson.

phylogeny. He also participated in studies on the systematics of other insect groups and as with Geoff Scudder, has contributed to the supervision of 40 graduate students. He has published 134 research papers and edited or co-edited five books. A world expert on Mexican Carabidae, he has amassed the most important collection representing Mexican species from more than 40 years of field work. In 1944 and 1945, George served in the Fifth Regiment, First Marine Division in the Asiatic-Pacific Theatre, receiving the Purple Heart, a Presidential Unit Citation-Okinawan Campaign, and the Victory Medal.

George Ball has always promoted a rigorous work ethic having the habit of arriving at his office at early hours and leaving after most others had left. He was the epitome of academia and was an instrumental and yet, gentle force in shaping the careers of numerous undergraduate and graduate students. Many of these students went on to important and influential positions in institutions such as the Biosystematics Research Centre in Ottawa, the British Museum of Natural History, the California Academy of Sciences and the Smithsonian Institute.

Hugh Danks completed his Ph.D. at the Imperial College of the University of London in 1968 and in the same year came to Canada as a Postdoctoral Fellow with the Entomology Research Institute in Ottawa. He then had research and teaching positions at three universities until hired as Head of the BSC in 1977. He carried out research on modes of seasonal adaptation in insects (such as cold-hardiness, diapause and the control of life cycles), the diversity and adaptations of Arctic insects, and the fauna of Canada in the context of North America. His ability to synthesize complex entomological topics

of importance to Canadian entomology produced many thought-provoking and thorough reviews and made him well known internationally, drawing attention not only to the BSC, but to Canadian entomology. He produced about 115 publications including major books on arctic arthropods and on insect dormancy. He also edited volumes on Canada and its insect fauna, insect life-cycle polymorphism and insects of the Yukon. The first and last of these highlighted the synthesis and coordination roles of the BSC, drawing together the work of many authors into a cohesive whole: *Canada and Its Insect Fauna* (1979) established a baseline for study of the fauna; *Insects of the Yukon* (1997) treated an area of great faunal significance. As part of his role as Head of the BSC, Hugh travelled the country each year visiting universities and government laboratories, meeting and encouraging researchers and students and fostering cooperative projects. He had a repertoire of about 50 seminars on Canada's insect fauna and biological surveys, seasonal adaptations and other topics that he could have ready for presentation within minutes. Hugh has also been involved in teaching children about insects, especially through authorship of the *The Bug Book and Bottle*, and talks stemming from this 1987 publication; he wrote an expanded edition published in 2009. Two million copies of this book have been sold and it has been translated into several languages.

It has been an honour for me and all members of the Scientific Committee of the Biological Survey of Canada to work closely with these three exceptional individuals over the past 30 years. They have always led by example and their love of the natural world, hard work, and scholarship have been an inspiration that has forever enhanced and changed our lives.

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