

Proceedings of the Pollination: Science and Stewardship Symposium

University of British Columbia - Okanagan Campus, Kelowna,
British Columbia, March 20, 2017

INTRODUCTION

Jennifer Heron¹ and Cory S. Sheffield²

Assessing the threats to and the conservation status of pollinators is emerging as one of the greatest challenges facing conservation practitioners today. The diversity of pollinator taxa and their cumulative contributions to natural ecosystem health and human well-being involve complex, albeit often poorly understood, relationships. Increased concern about the plight of pollinators has resulted in increased funding for education and research on these topics, which is strengthening science-based policy and increased public awareness. A symposium was held on March 20, 2017, at the University of British Columbia, Okanagan Campus, in Kelowna, on pollinator science and stewardship. The symposium brought together eight speakers who discussed topics related to pollinator conservation, providing examples and case studies of conservation assessment, public engagement, pollinator policy, and ideas regarding how to address the challenges that are faced by pollinators and pollinator-stewardship practitioners. The symposium also facilitated connections that enable lands managers, owners, stewards and conservation practitioners to take this information and apply it to their own conservation practices.

Support for the symposium was provided by the federal Habitat Stewardship Program for the Prevention of Species At Risk, the B.C. Ministry of Environment and Climate Change Strategy, the Royal Saskatchewan Museum, the British Columbia Conservation Foundation and the Entomological Society of British Columbia.

The buzz on Yukon bees

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Amid the growing concern for the fate of bees, I have begun several studies on bees in northern British Columbia and the Yukon, collaborating with Paul Williams at the Natural History Museum (UK) and Cory Sheffield (Royal Saskatchewan Museum). Over the past six years, these studies have revolved around focused collecting with nets and traps in the various ecosystems of the north.

In general, bumblebee species that have declined dramatically in the south (e.g., the Western Bumblebee [*Bombus occidentalis occidentalis*] and Yellow-banded Bumblebee [*Bombus terricola*]) are still common in the southern Yukon. However, the Gypsy Cuckoo Bumblebee (*Bombus bohemicus*; assessed Endangered in Canada by the Committee on the Status of Endangered Wildlife in Canada [COSEWIC]) seems to be much sparser than it was in the 1980s. We have found this species in two localities: Stewart Crossing in 2014 and Kluane in 2016. These are the only detections of this species in North America in the past five years.

Mitochondrial DNA analysis of some of the bumblebees we've collected has revealed a new species of subarctic bumblebee in the subgenus *Alpinobombus*, now named *Bombus kluanensis*. Even though we now have a better idea of the status of most northern bees, we do not have good data on ongoing trends. To tackle that issue, we are

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planning to institute a repeatable monitoring plan for bumblebees in the Yukon and northern B.C., modeled after the North American Breeding Bird Survey.

Honeybees and honeybee health

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Honey bees (*Apis mellifera*) have been experiencing high levels of colony loss on a regular basis over the past decade. While speculation originally centered on the idea that there was a single mysterious cause, we now know that multiple stressors are interacting, sometimes in unpredictable ways to cause problems for this critically important crop pollinator. Exciting progress is being made on high- and low tech-solutions to help mitigate these losses, and some of these research innovations include using molecular and proteomic markers, as well as conventional approaches to breed bees for resistance to parasites and pathogens. Managing viruses through more effective management of their primary vector, the *varroa* mite, and using RNAi to control viruses also can be effective in helping beekeepers mitigate losses from some of the more critical stressors in the system.

COSEWIC and the General Status of Species in Canada

David F. Fraser, British Columbia Ministry of Environment and Climate Change Strategy, Species Conservation Science Unit, Victoria, B.C. V8W 1M8

The status of species at risk in Canada is assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC recommends species in the at-risk category to the federal Minister of Environment and Climate Change for listing under the federal *Species At Risk Act (SARA)*. To date, there have been 976 wildlife species assessed by COSEWIC, and 521 of these are listed on Schedule 1 of *SARA*. The Program on the General Status of Species in Canada provides overview of the status of biodiversity in Canada every five years and bears no legal implication. In 2013, this program moved to using the same assessment system as used by NatureServe and the B.C. Conservation Data Centre. The latest General Status report, covering the 2000–2015 timespan, assessed 29,848 species. The COSEWIC assessment process requires extensive time and resources, and prioritizing which species to recommend for assessment is a challenging task. Results from the General Status are one of the inputs that helps guide the determination of which species are priorities. In addition, other factors, such as the percent of the species range in Canada, the species global status, and the pattern of decline, is used by COSEWIC to modify the priority score a species is given. A thorough understanding of both the General Status and COSEWIC processes is important for prioritizing species recommended for status assessment.

Butterfly conservation in Canada: threats and challenges

Jennifer M. Heron, British Columbia Ministry of Environment and Climate Change Strategy, Species Conservation Science Unit, Vancouver; B.C. V3R 1E1

Butterflies are a well-known and well-studied group of pollinators. Approximately 275 butterfly species are known to occur in Canada, although only 21 have been assessed nationally by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). There are numerous challenges to assessing the lesser known and poorly documented butterfly species, particularly when the host plant(s) are unknown, the threats are unclear, and the species' habitat and associated plant communities are undescribed. Museum collections are important sources for historical information and, at one time, butterfly specimens were more widely collected and deposited at museums. However, historical collection data are often biased, not databased, or incorrectly identified. In the past few decades, butterfly surveys have moved away from specimen collection and museum deposition, and instead focus on visual surveys or photographic evidence—a method that is good for conserving populations but has other drawbacks.

Using examples from the south Okanagan, this talk will provide an overview of the challenges to assessing butterflies, how candidate species are recommended for COSEWIC assessment, challenges to assessing the lesser known species, and ways conservation practitioners can include butterflies in land management decisions and planning.

Border Free Bees: artists linking science and communities for pollinator conservation

Nancy Holmes and Fionncara MacEoin, The University of British Columbia, Okanagan Campus, Faculty of Creative and Critical Studies, Kelowna, B.C. V1V 1V7

Border Free Bees (BFB) is a Social Sciences and Humanities Research Council (federal) funded provincial initiative in which artists lead community engagement projects to enhance awareness and inspire action around pollinator conservation. Along with several projects in the Lower Mainland, BFB has two major projects underway in Kelowna—The Public Art Pollinator Pasture and the Kelowna Nectar Trail. Designed to address the decline in native habitat, BFB is an ambitious and creative pollinator-focused arts-based research initiative, headed by Dr. Cameron Cartiere, Associate Professor at Emily Carr University of Art + Design (ECUAD) and Nancy Holmes, Associate Professor in Creative Studies at The University of British Columbia, Okanagan (UBCO). The research project's mission includes raising awareness of the plight of wild pollinators, particularly bees, and transforming underused urban sites into aesthetically pleasing and scientifically viable habitats. Border Free Bees uses public art and design methodologies to empower communities to actively engage in these restoration initiatives and equips individuals and communities with the knowledge and tools to take stewardship of such public projects.

From personal to planetary: making an impact on pollination at different scale

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Research and initiatives that focus on pollination have impacts on different scales. With the International Pollinator Initiative (UN-FAO), local researchers worked with small-scale farmers using a common method to examine pollination deficits. This was repeated in multiple countries in multiple regions around the world, resulting in a scaled-up key finding regarding the role of wild pollinators in agroecosystems. Recently, the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) completed their Summary for Policymakers and assessment report on Pollinators, Pollination and Food Production. These key findings, which included policy options, were adopted (Decision XIII/15) at the Convention on Biological Diversity Thirteenth Conference of the Parties (COP-13). Furthermore, these key findings have already had an impact on many national pollinator strategies and were the basis of a new multinational initiative, the Coalition of the Willing on Pollinators.

Pesticides and pollinators: evidence, controversy and policy

Nigel Raine, University of Guelph, School of Environmental Sciences, Rebanks Family Chair in Pollinator Conservation, Guelph, ON N1G 2W1

Recent concern over global pollinator declines has led to considerable research on pesticide impacts. Here, we report on a series of recent studies that examine the extent to which field-realistic insecticide exposure can lead to significant sublethal impacts on individual bumblebee behaviour (e.g., reduced queen colony founding success and impaired worker learning and foraging), colony function (e.g., effects on growth rates and forager recruitment), and the critical ecosystem services they provide to crops and wild plants. Taken together, these effects could have widespread implications for the stability of wild pollinator populations, sustainable production of pollinator-limited

crops, and maintaining wild-plant biodiversity. Considering these studies that report insecticide impacts on non-*Apis* (honey) bees into the wider context, particularly alongside divergent results from honey bee field trials, has important potential ramifications for pesticide-use policies.

Integrated wild pollinator management: putting wild bees to work for crop and wildflower pollination

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Bees, unlike many other groups of pollinating insects, are Central Place Foragers, foraging for floral resources in areas surrounding their nest, the radius being approximately equal to the maximum flight distance of the individual species (larger bees typically flying further). For a nesting bee, being restricted to this area has implications for both pollination and conservation, because this landscape must provide ample nectar and pollen and, for some species, nesting materials; areas lacking all the requirements will be abandoned and, over the long term, will lose bee populations. Canada has more than 850 wild bee species, and a large proportion of these are generalist pollen users and visit (thus pollinate) many of our crops. Many of these same species also visit non-crop plants, so provide valuable ecological services to the natural and semi-natural communities surrounding crop lands. Central Place Foraging, body size, flight range, and floral resource availability all have to be considered when considering the use of wild bees for crop pollination and in maintaining populations for pollination in non-crop habitats. These factors, along with life history characteristics of bees, will be discussed in the context of pollination and management of wild bees.

Pollinator Partnership Canada

Lora Morandin, Pollinator Partnership Canada, Victoria, B.C.

Pollinator Partnership Canada (P2C) is the first international expansion of Pollinator Partnership (P2), which is the largest non-profit organization dedicated solely to the preservation of pollinators and their ecosystems. Pollinator Partnership and P2C work to conserve pollinators through research, policy, outreach and education, collaboration, and habitat creation. Pollinators are directly responsible for providing approximately one-third of the food we eat and are essential to natural ecosystems. Yet, both managed and wild pollinators are facing numerous pressures and population declines due to habitat loss, pest and diseases, invasive species, climate change, and exposure to pesticides. In Canada, P2C has created a national planting guide for honey bee forage in association with the Bee Health Roundtable, created 14 new ecoregional pollinator planting guides with native plant lists, and reviewed Canadian bee habitat programs. We are beginning new programs to promote monarch conservation through research and habitat creation and are launching local networks to facilitate education and collaborative action.