CANADIAN ASSOCIATION OF PROFESSIONAL APICULTURISTS

L'ASSOCIATION CANADIENNE DES PROFESSIONELS DE L'APICULTURE

Proceedings 2021/22
(Virtual meeting)
November 4th and 5th, 2021

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AGENDA

Canadian Association of Professional Apiculturists
2021/22 Annual General Meeting (Virtual Meeting)
November 4th and 5th, 2022

Free Registration for CAPA Members

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MINUTES

Members Present

Alexandra Panasiuk, Alison McAfee, Amanda Gregoris, Andrée Rousseau, Andrew Byers, Andrew Pitek, Cameron Menzies, Cassandra Docherty, Chris Maund, Colette Mesher, Daniel Borges, Daryl Wright, Derek Micholson, Emily Olson, Ernesto Guzman, Fletcher Colpitts, Gabrielle Claing, Gail MacInnis, Glenys Robinson, Graham Parsons, Graham Thompson, Heather Higo, Janet Tam, Jason Sproule, Jeff Kearns, Julia Common, Julie Ferland, Karen Kennedy, Kelsey Ducsharm, Kerry Clark, Leonard Foster, Marilène Paillard, Mark Winston, Marta Guarna, Martine Bernier, Mathieu Boucher, Medhat Nasr, Melanie Kempers, Mélissa Girard, Michael Peirson, Monica Winkel, Mylee Nordin, Nicolas Tremblay, Nuria Morfin, Olav Rueppell, Olivia de Herdt, Patricia Wolf Veiga, Paul Kelly, Paul Kozak, Paul van Westendorp, Pierre Giovenazzo, Rassol Bahreini, Renata Borba, Rheal Lafreniere, Rob Currie, Samantha Muirhead, Shelley Hoover, Stephanie Otto, Stephen Page, Steve Pernal.

Guests

Judy Wu-Smart, Kim Skyrm (AIA), Kurt Randall, and Rod Scarlett

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Welcome and Introductions

Shelley Hoover

President Shelley Hoover called the meeting to order at 10:05 am (CST). President Hoover welcomed the membership to the 64th annual meeting and thanked the organisers. A round table of introductions was made for those in attendance.
Secretary Renata Borba explained the proceedings of the virtual meeting (*e.g.,* voting, commenting).
Past president Medhat Nasr explained how the election was going to proceed and welcomed members to enter nominations.

Approval of Agenda

Shelley Hoover

MOTION:	**Motion to approve the agenda as circulated.**
MOVED BY:	**Medhat Nasr**
SECONDED BY:	**Steve Pernal**
CARRIED	

President's Report 2021

Shelley Hoover

Dr. Shelley Hoover, President, Canadian Association of Professional Apiculturists
University of Lethbridge

Welcome to the 64th Annual Meeting of the Canadian Association of Professional Apiculturists (CAPA). I would especially like to welcome our guests to our AGM and thank them for attending. This is our second consecutive online AGM due to the ongoing COVID-19 pandemic. Our ability to connect using technology is remarkable, and it has allowed members who could not attend in-

person meetings to participate more fully, but I am looking forward to a time when we can again gather in-person.

This year we are working in conjunction with the Apiary Inspectors of America and the American Association of Professional Apiculturists to host a (North) American Bee Research Conference (NABRC). This will be held in January 2022, and will be a virtual event, and will be a great opportunity to present and learn about current apicultural research. As there will be no CAPA/CHC Research Symposium associated with our AGM this year, we hope to see a lot of Canadian submissions, especially student presentations at the ABRC.

We continue to see great concern over the health of honey bees in Canada, with a national winterloss rate of 23%. The winter mortality varied across the country, with Nova Scotia reporting 12% mortality, and Alberta and BC reporting much higher mortality at 32%. Commonly cited reasons for the mortality included the usual causes: poor queens, ineffective Varroa control, weak colonies in the fall, weather, and starvation. I want to thank the committee for producing a preliminary report, and their commitment to releasing these data and the final report so quickly. Thank you, Gabrielle and Julie, for your leadership on this.

Many of our committees have been very busy over the past year. There has been an increase in activity in the non-apis pollinator committee, new tech teams have been formed, and there is always activity for the Bee Movement and IPM Committees, so we will look forward to their reports and the complete versions in the proceedings.

I want to acknowledge the support and assistance I have received from our capable executive committee members over the past year: Vice-President Ernesto Guzman, Secretary Renata Borba, Treasurer Martine Bernier, and Past-President Medhat Nasr. I also wish to thank members of our standing and ad-hoc committees for their hard work over the last year.

This meeting is the last that I will preside over as CAPA president, I want to thank you all for trusting in me enough to acclaim me to the position four years ago in Kelowna when you were left with no choice. But in all seriousness I have enjoyed working on behalf of the membership as President, and I have learned a lot and it has been my pleasure to get to know many of you much better of the last four years. I want to thank the collective consciousness of all the past CAPA presidents for their advice over the years. To the next CAPA President, whomever that will be, I offer you my congratulations, and my support in the role of Past-President.

During my tenure as President I have had three different jobs, two employers, lost family members, and weathered the pandemic, including a period of home-schooling reluctant teenagers. Many of you have faced similar challenges, and I wish to thank you all sincerely for your support of me, of CAPA, of the beekeeping industry, and especially one another over the past two years in particular.

The CAPA executive bids farewell to Medhat Nasr after his twelve years of service, and to Renata Borba and Martine Bernier who have served as Secretary and Treasurer for the last four years. I want to thank all of you for your contributions during your terms, it has been my great pleasure to work with each of you as well as our Vice-President over the past year Ernesto Guzman, and Les Eccles previous to that.

The positions of Secretary, Treasurer, Vice-President and President will all be elected in this meeting. Nominations were accepted by Medhat Nasr, and if required Renata will arrange a confidential online vote on our second day of meetings. We have a very full agenda ahead of us over the next two days, I hope you have a productive and enjoyable meeting.

MOTION: **Motion to accept the President's Report as presented.**
MOVED BY: **Paul Kozak**
SECONDED BY: **Marta Guarna**
CARRIED

Minutes of 2020/21 Meeting
Renata Borba

Secretary Renata Borba indicated that the Minutes of the 2020/21 AGM (Virtual) were previously circulated on CAPA-L. Final Proceedings have been posted on the CAPA website.

MOTION: **Motion to accept the Minutes of the 2020/21 AGM as circulated.**
MOVED BY: **Rob Currie**
SECONDED BY: **Paul Kozak**
CARRIED

Financial Report for 2021
Martine Bernier

2021 CAPA Treasurer's Report

The Membership list is currently up to date. Listed here are members that paid 2021 or 2022:

	Active (in good standing – as of Oct. 2021)
Full Members	55
Associate Members	12
Honorary Members	13
Total	**80**

Total Cash on hand as of October 31st, 2021:

Community Plan Plus (day to day banking)	$ 28 598.23
GIC Term Deposit (yearly auto renewal)	$ 10 798.33
Term Deposit (Monthly auto renewal)	$ 10 252.61
PAYPAL Account (electronic payment option)	$ 96.20
Cash	$ 216.00
Total Cash	**$ 49 961.37**

Publication Sales in 2021

	Sales	
English	$ 11 166.73	+ tx & S/H
French	$ 550.00	+ tx & S/H
Spanish	$ 60.00	+ tx & S/H

Outstanding publications invoices:	*($ 1 121.60)	tx and S/H included

* Two of them are September or later invoices, one will likely not be paid, two needs follow up.

Meetings:

- 2021 Remote AGM (October) cost is $0
- There was no travel of executives made in 2021. One check $705.33 was for Ottawa 2020 meeting (receipts sent late in 2020, check cashed early in 2021). We usually budget $2000.

Donation to research:

- IBRA Donation for 2021 was $495.16. We budgeted $500 for 2021.
- We donated $15 000 for CBRF in 2021, as planned at the last meeting

Student merit awards

- Two awards of $ 600 each (one MSc and one PhD) were announced in September 2021. The checks still need to be done and delivered.

CAPA website:

- Changes were made in the website in 2021. An annual cost of $350 for the MemberPress plugin must be approved by members.

GST/HST for 2021 was paid in January 2021, we owed $113,72.

A document containing instructions and tasks for the next treasurer has also been prepared.

2021 CAPA Financial Statement

GIC Term Deposit Balance (yearly)	01-Jan-21	$	10,696.71
GIC Term Deposit Balance (Monthly)	01-Jan-21	$	10,248.34
TD bank Account	01-Jan-21	$	30,233.51
Paypal Balance	01-Jan-21	$	2,857.57
Cash	01-Jan-21	$	216.00
	Total assets	$	54,252.13

REVENUE				Planned for 2021	As of Oct 31st 2021	Projected as of Dec 31st 2021	Comments
Membership		cost	members				
15	2022 Full	40	55		$ 600.00	$ 2,200.00	
3	2022 Associate	20	12		$ 60.00	$ 240.00	
40	2021 Full			$ 960.00	$ 1,580.00	$ -	
5	2021 Associate			$ 80.00	$ 120.00	$ -	
2	2020 Full				$ 80.00	$ -	
	2020 Associate						
Meetings							
	2021 Meeting (online)			$ 5,000.00	$ -	$ -	
	2022 ABRC Conference (online)	45$ pro, 15$ student				$ 975.00	* 20 professionals & 5 students expected
			number of sales as of publications report				* nb of sales of 2021 vs $ received in 2021 may differ
2021 ENG Publication Sales			1002	$ 10,000.00	$ 11,166.73	$ 12,000.00	* difference includes exchange rate from USD checks
2021 FR Publication Sales			42	$ 500.00	$ 550.00	$ 590.00	
2021 SP Publication Sales			6	$ 500.00	$ 60.00	$ 60.00	
Shipping/handling on publications				$ 1,500.00	$ 2,324.73	$ 2,500.00	
GST/HST collected				$ 900.00	$ 273.12	$ 290.00	* on publications (and meeting registration)
GIC Term interests				$ 50.00	$ 105.89	$ 105.89	
				$ 19,490.00	**$ 16,920.47**	**$ 18,960.89**	

Expenditures		Planned for 2021	As of Oct 31st 2021	Projected as of Dec 31st 2021	
Publications					
	S/H charges (all editions)	$ (1,500.00)	$ (1,126.56)	$ (2,110.00)	* Janet and Martine's last shipping reimbursement
	Shipping honorarium (Janet Tam)	$ (300.00)	$ (300.00)	$ (300.00)	* 2020 & 2021
	storage	$ (1,599.80)	$ (1,415.76)	$ (2,400.00)	* 2020, 2021 & 2022
Meetings	AGM	$ (5,000.00)		$ -	
	Travel of Executive to meetings	$ (2,000.00)	$ (705.33)	$ (705.33)	* 2020
IBRA Donation		$ (500.00)	$ (495.16)	$ (495.16)	
CBRF Donation		$ (15,000.00)	$ (15,000.00)	$ (15,000.00)	
Student Merit Awards	2 x (600$ + 1000$ max travel expenses)	$ (3,200.00)	$ -	$ (1,200.00)	* only award this year, no travel expenses
Student Presentation Award (given in some years at research symposium)		$ -	$ -	$ -	
CAPA MERIT AWARD new queen model or other		$ (2,000.00)	$ -	$ -	
CAPA Website Hosting		$ (1,200.00)	$ (519.85)	$ (1,039.70)	* 2020 & 2021
Communications for website		$ (2,000.00)	$ (499.49)	$ (499.49)	* 350$ for memberpress plugin (renews annually) + 150$ implement of plugin
GST/HST Paid		$ (700.00)	$ (604.60)	$ (710.00)	
2020 GST/HST Payment CRA		$ (113.72)	$ (113.72)	$ (113.72)	
Misc. (cards, shipping, postage, gift card etc)		$ (50.00)	$ (156.68)	$ (156.68)	* checks order
Banking Fees (includes PayPal)		$ (260.00)	$ (274.08)	$ (280.00)	
CAPA Workshop for professional development of members		$ -	$ -	$ -	
	Expenditures	**$ (35,423.52)**	**$ (21,211.23)**	**$ (25,010.08)**	
	Revenue-expenditures	**$ (15,933.52)**	$ (4,290.76)	$ (6,049.19)	

		As of January 1st 2021	As of October 31st 2021	Projected as of Dec 31st 2021
GIC Term Deposit (1 year cashable at 0.2%; Matures 26 May 2022)		$ 10,696.71	**$ 10,798.33**	**$ 10,798.33**
GIC Term Deposit (30 days renewable at 0.05%; Matures 28 Novembre 2021)		$ 10,248.34	**$ 10,252.61**	**$ 10,252.61**
Cash in TD account		$ 30,233.51	**$ 28,598.23**	**$ 27,152.00**
PayPal		$ 2,857.57	**$ 96.20**	**$ -**
Cash		$ 216.00	**$ 216.00**	**$ -**
	Total Cash / Investments	$ 54,252.13	$ 49,961.37	$ 48,202.94
Should maintain at least $15,000 RESERVE	Predicted Surplus/deficit		$ 49,961.37	$ 48,202.94

ACTION ITEM: Budget Committee to consist of Rob Currie, Steve Pernal and Paul van Westendorp.

MOTION: The CAPA membership to approve that the Awards Committee should order 20 queen statues for the Award of Merit from the artist George Foster and that the costs be paid out as required in 2021 or 2022 as required. The estimated cost is $315 each and 20 will cost approximately $6300 + $945 tax.

MOVED BY: **Rob Currie**
SECONDED BY: **Medhat Nasr**
CARRIED

MOTION: **To keep CAPA membership dues at $40 for full membership and $20 for associate membership.**
MOVED BY: **Medhat Nasr**
SECONDED BY: **Rob Currie**
CARRIED

MOTION: **Motion to approve the proposed 2021 budget**
MOVED BY: **Steve Pernal**
SECONDED BY: **Medhat Nasr**
CARRIED

ACTION ITEM: For the new treasurer to consider the following changes to the bylaws "Any person becomes a member of CAPA starting Oct 1st the paid dues will be considered as the following years dues".

ACTION ITEM: The Treasurer (and members of the Budget Committee) will explore investment vehicles that offer higher rates of return compared to current investments and share its findings with the CAPA membership.

CHC Report
Rod Scarlett, CHC executive director

Rod Scarlett presented an overview of the CHC activities over the past 12 months. These included:

-The Hive Health Committee is currently working with CAPA on the label expansion of Oxalic-glycerin application. The registration of Flumagilin-B was transferred to Vita Bee Health, and the same process will be done for Formic 65 and Oxytet.
-There is a major concern on the efficacy of varroacides, the CHC supports screening of the efficacy of vaccoacides.
-CHC is involved in the administration of the Canadian Bee Research Fund, and involvement in the distribution of funds to Canadian Bee Research Projects.
-There is a concern in examining maximum residue limits of agrochemicals (MRLs), including glyphosate and Quinclorac, in honey samples for export.
-CHC continues to push for comprehensive testing of imported honey to the CFIA.
-Supporting work on mass spectrophotometry for honey testing.
-Working on getting industry buy-in on standardize testing of domestic honey and developing a Canadian definition of honey.
-Contributing to the Apimondia stamen on honey fraud and consumers and beekeeping awareness of honey fraud cases.
-Arranging of charters to transport Temporary Foreign Workers to Canada (> 300 workers from Nicaragua), and involvement in discussions of housing, quarantines, vaccination passports, and vaccine acceptance for next season.
-Developing of training videos with the Canadian Agricultural Human Resource Council for employees on biosecurity, seasonal management, worker health and safety, and movement of bees for pollination in English, French, and Spanish.
-Arranging of flight transportation of bee packages from New Zealand, Australia, and Chile.
-Addressing questions to CFIA on how and who make requests for the importation of queens from Malta, Italy, and Ukraine.

-Expressed concerns on the limitations on exporting queens from Canada to the US.
-Expanded and improved the information in the Export Catalogue.
-Participation in trade shows scheduled for 2022.
-Announcement of the winner of the Willie Baumgartner Memorial Award to Pierre Giovenazzo.

President Hoover thanked Rod Scarlett for his presentation.

Power Point presentation is available in Appendix 1

AAFC National Statistical Trends in Honey, Beekeeping and Pollination
Stephen Page, AAFC

Stephen Page discussed the statistics of imports and exports of bees, queens, and honey.
The total value of imports (queens and package bees) in 2021 dropped to from $12 M to $9.2 M, due to limited resources, particularly from New Zealand. In April, 8,500 packages arrived from New Zealand, and a small shipment of 98 from Chile; a total of 8,861 packages were imported, mostly from New Zealand, Australia, and Chile (lowest levels in many years). Package bee shipments dropped, most source countries were cut-off by transportation/COVID barriers. The main source of queens is the US, particularly Hawaii and California, with a total of 218, 476 queens imported to Canada. Eight source countries provided 41, 610 queens, including New Zealand, Australia, and Chile. The total of imported queens to Canada in 2021 was of 260, 061. California increased their imports by 16% and Hawaii by 9%, importing a total of 218, 000 queens to Canada. The average price per queen dropped to $32.60, (ranging from $23.50 to $46.72).

On honey trade, based on data from early 2021, the patterns are similar to 2020. As Canadians consume more of their domestic honey, the imports are tending to decrease compared to 12 years ago and the exports volumes are also decreasing. Japan is the number one buyer of Canadian honey (CAD$28, 984, 705), followed by the US (CAD$18, 676, 074), and South Korea (CAD$8, 533, 536). The average price per lb between Japan and the US is close (CAD$2.72 and CAD$2.77, respectively). The value of imports top New Zealand to Canada is of CAD$3, 372, 234, with an average price per lb of $2.52. Top import sources for honey to Canada also include Brazil and India.

Discussion: The members discussed differences in the exports of queens compared to previous years, and the major importers of Canadian honey.
President Hoover thanked Stephen Page for his presentation.

Power Point presentation is available in Appendix 2

PMRA Update
Kurt Randall, PMRA

There are no changes in the pest control products registered for *Varroa* mite control from the last report.
The pollinator risk assessment is completed for all pest control products, and includes all outdoor uses, greenhouse uses, and all types of pest control products. The Pollinator Risk Assessment Guidance is available online [http://Canada.gc.ca/pollinators or http://Canada.gc.ca/pollinisateurs].
Pollinator precautions are based on the results of the pollinator risk characterization and crop specific considerations.

The pollinator precaution levels are classified as most restrictive (e.g. no application during bloom for highly attractive crops), moderately restrictive (e.g. apply in the evening), and least restrictive (minimal restrictions or no restrictions).

The practices to reduce bee poisoning from agriculture pesticides in Canada are available online [http://pollinatorpartnership.ca/en/reducing-bee-poisoning], prepared by the Pollinator Partnership Canada commissioned by Agriculture and Agri-Food Canada on behalf of the Bee Health Roundtable.
Updates on neonicotinoid assessments were published, including re-evaluations and final decisions on thiamethoxam, clothianidin, and imidacloprid. As a result of the re-evaluations, there will me modifications in the products' labels.

No changes were reported in bee incidents compared to previous years. There are no indications of new concerns. Two incident reports related to the application of amitraz were received.
The Pollinator Protection – Health Canada PMRA website is being updated.

President Hoover thanked Kurt Randall for his presentation.

Committee Reports
Publications Report
Steve Pernal

2021 Report of the CAPA Publications Committee

In 2021, sales of the English edition of the CAPA "Honey Bee Diseases and Pests" (3rd edn.) remained reasonably strong with 1,002 copies being sold from January to the end of October. A check of inventory indicates that 1,953 of the books remain. Plans for reprinting should be made in early 2023.
For the same time period, 42 French editions were sold, with 285 remaining in stock, while 6 Spanish editions were sold with 688 remaining. No reprinting of these versions is required yet.
CAPA also does pay storage for the English and Spanish editions, at $799.90 per year, to the Royal City Brewing Warehouse in Guelph, ON.
CAPA currently sells the English, French and Spanish versions for $10, not including shipping and handling.
Janet Tam has agreed to continue distributing the English and Spanish versions. Martine Bernier currently manages the French orders, and will remain doing so.

S. Pernal, Chair.

Committee Members: Janet Tam, Martine Bernier, Nicolas Tremblay

Discussion: The members discussed how to increase the distribution of the Spanish version of the manual, including promoting it in beekeeping operations in Canada and Latin-American associations, continue its promotion, and considering donations. Also, the members discussed the possibility of updating the manual.

ACTION ITEM: Publication committee to work with the Communication committee to add information to the website about the minimum purchase number (10) of the CAPA disease book, as well as to add a list of retail suppliers by province to direct those interested in purchasing a low number of copies.

MOTION: **Motion to accept the Publications Report as submitted.**
MOVED BY: **Paul Kozak**

SECONDED BY: **Medhat Nasr**
CARRIED

Winter Loss Survey Report
Gabrielle Claing

Canadian Association of Professional Apiculturists Statement on Honey Bee Wintering Losses in Canada (2021)

Prepared by CAPA National Survey Committee and Provincial Apiarists: Julie Ferland (cochair), Gabrielle Claing (cochair), Melanie Kempers, Karen Kennedy, Paul Kozak, Rhéal Lafrenière, Chris Maund, Cameron Menzies, Samantha Muirhead, Medhat Nasr, Lynae Ovinge, Steve Pernal, Jason Sproule, Paul van Westendorp, Geoff Wilson and Shelley Hoover

Summary

The Canadian Association of Professional Apiculturists (CAPA) and Provincial Apiarists coordinated the annual honey bee wintering loss report for 2020-2021. As in previous years, the survey consisted of harmonized questions based on the national beekeeping industry, with Provincial Apiarists collecting survey data across all provinces. Respondents collectively operated 398,961 honey bee colonies across Canada, representing 52% of all colonies wintered during 2020-2021. The national winter loss, including non-viable bee colonies, was 23.2% with provincial losses ranging from 12.2% to 32.2%. The overall national colony loss reported in 2021 is slightly less than the average reported losses since 2007 (25.8%). Despite these reported annual losses, through the hard work of beekeepers replacing dead and weak colonies and making increases, Statistics Canada reports that the total national colony count has increased by 26.7% during the period between 2007 and 2020.

Each province ranked the top four suspected causes of colony losses as reported by respondents. These varied from province to province. The most frequently cited causes of colony losses were poor queens, weak colonies in the fall and ineffective varroa control. When asked whether COVID-19 related issues had an impact on winter mortality, respondents reported a low impact (mean of 1.3 to 3 on a scale of 1 to 10). For beekeepers who reported a higher impact of COVID on winter mortality (score of 6 and more), the most frequent issues were access to labour, access to bees and access to supplies.

Beekeepers also responded to questions on the management of three serious parasites and pathogens to beekeeping: Varroa destructor, Nosema spp. and American Foulbrood: Paenibacillus larvae. The majority of beekeepers in most provinces reported that they monitored for varroa mites. The most commonly reported varroa treatments were: Apivar® or formic acid treatments in the spring; Apivar® or formic acid in the summer or fall; and oxalic acid in late fall. Many Canadian beekeepers treated their colonies to mange the risk of nosemosis and American foulbrood. Across the country, registered antibiotics were the commonly used treatments; nevertheless, methods and timing of application varied from province to province.

Provincial Apiarists, technology-transfer personnel, and researchers have been working with beekeepers across Canada to encourage them to monitor for honey bee pests, especially varroa mites, brood diseases, and nosema, and adopt recommended integrated pest management practices to keep these pests under control. CAPA members continue to work through working groups encompassing diverse stakeholders to educate and to develop and improve management options for beekeepers to keep healthy bees and manage winter loss in Canada.

Disclaimer and Credits: Survey data were supplied by the Provincial Apiarists (listed in Appendix A). Data were then compiled, further analyzed and an initial draft of this report written by Gabrielle Claing, Julie Ferland, Geoff Wilson and Medhat Nasr, with subsequent review by the CAPA National Survey Committee.

Introduction

For over a decade, many countries, including Canada, have surveyed beekeepers and reported overwintering mortality rates of honey bee colonies and management practices used for varroa mites, nosema and American foulbrood. The Canadian Association of Professional Apiculturists (CAPA) has worked with the Provincial Apiarists on reporting winter losses of honey bee colonies and possible causes of bee mortality in Canada since 2007. The objective of this national report is to consolidate provincial honey bee data across the country based on information collected through harmonized survey questions. The possible causes of winter loss, as reported by beekeepers, and information on pest surveillance and control are collated herein. The survey results aid in identifying gaps in current management systems, developing strategies to mitigate colony losses, and also provide guidance for improving bee health, biosecurity practices, and industry sustainability.

Methodology

In 2021, the Provincial Apiarists and the CAPA National Survey Committee members reviewed the questions used in the 2020 survey and made necessary revisions. Examples of these revisions include new treatments or strategies for beekeepers to manage pests and diseases as they are developed over the years, and the impacts of COVID-19 on beekeeping practices. The result was an updated harmonized set of questions that was used in the 2021 survey (Appendix B). These questions took into account the large diversity of beekeeping industry profiles, management practices and seasonal activities within each province. Some provinces also included supplementary regional questions in their provincial questionnaire. The results of these regional questions are not included in this report and are reported in summary form. Further questions about results from a specific province may be accessed by contacting the Provincial Apiarist of the province in question (Appendix A).

Beekeepers that owned and operated a specified minimum number of colonies (Table 1) were included in the survey. The survey reported data from full-sized producing honey bee colonies that were wintered in Canada, but not nucleus (partial) colonies. Thus, the information gathered provides a valid assessment of honey bee losses and commercial management practices.

The common definitions of a honey bee colony and a commercially viable honey bee colony in spring were standardized as follows:

- Honey Bee Colony: A full-sized honey bee colony either in a single or double brood chamber, not including nucleus colonies (splits).
- Viable Honey Bee Colony in Spring: A honey bee colony that survived winter, with a minimum of 4 frames with 75% of the comb area covered with bees on both sides on May 1st (British Columbia), May 15th (New Brunswick, Nova Scotia, Ontario, Prince-Edward-Island and Quebec) or May 21st (Alberta, Manitoba, Saskatchewan and Newfoundland and Labrador).

The colony loss and management questionnaire was provided to producers using various methods of delivery including mail, email, an online and a telephone survey; the method of delivery varied by jurisdiction (Table 1). In each province, data were collected, summarized and analyzed by the Provincial Apiarist. All reported provincial results were then analyzed and summarized at the national level. The national percent winter loss was calculated as follows:

Percentage Winter Loss

$$= \left(\frac{\text{Sum of the estimated total colony losses per province in spring 2021}}{\text{Sum of total colonies in operation in each province for 2020}} \right) \times 100$$

Results

Throughout Canada, a total of 573 beekeepers responded to the 2021 survey. These respondents represented 39% of all the surveyed beekeepers. Respondents operated 52% of all registered colonies that were wintered in the fall of 2020. The rate of participation and number of colonies continues to represent a substantial proportion of the commercial beekeeping industry in Canada.

The survey delivery methods, size of beekeeping operations and response rate of beekeepers for each province are presented in Table 1. It is important to note that the total number of colonies operated in a province reported by this survey may vary slightly from Statistics Canada official numbers. In some provinces, the data collection periods for the provincial database and the Statistics Canada report at different times of year. This can result in minor discrepancies between the official Statistics Canada total number of colonies and this survey's total reported colonies per province.

Survey results showed that the national level of wintering loss including non-viable colonies was 23.2% with individual provinces ranging from 12.2% to 32.2%. The overall winter loss for 2020- 2021 was lower than 2019-2020 which had a loss rate of 30.2%. The level of winter loss varied from province to province, and among beekeeping operations within each province. In general, most provinces reported similar or lower mortality in 2020-2021 than the previous year, the exception being British Columbia reporting higher mortalities than last year. British Columbia and Alberta reported the highest winter losses in 2021 (32.2% and 31.9%, respectively), with ineffective varroa control cited as the most frequent cause contributing to colony mortality. It is worth noting that aside from British Columbia and Alberta, all other province's winter loss was below 20%, with the lowest winter loss, reported by Nova Scotia, at 12.2%.

Overall, 73% of the colonies owned by respondents were wintered outdoors in fall 2020, with remaining colonies (27%) wintered indoors (Table 2). The highest percentage of colonies wintered indoors was in Nova Scotia (76%) and Quebec (70%), followed by Manitoba (53%) and New-Brunswick (51%), whereas in British Columbia, there were no colonies wintered outdoors.

The mortality rate for colonies wintered outdoors and indoors for each province is presented in Table 3.

For detailed information about the winter losses in each province, please contact the office of the Provincial Apiarist directly.

Table 1: Survey parameters and honey bee colony mortality (2020-2021) by province.

Province	Total number of colonies operated in 2020	Estimated number of colonies lost based on the estimated provincial winter loss	Type of data collection	Number of beekeepers targeted by survey	Number of respondents (% of participation)	Minimal size of beekeeping operations targeted by survey (# of colonies)	Number of respondents' colonies that were wintered in fall 2020	Number of respondents' colonies that were alive and viable in spring 2021	Percentage of surveyed colonies as a proportion of the total number of colonies in the province	Provincial Winter Loss including Non- viable Colonies
Newfoundland and Labrador	800	145	Email, telephone, text	12	12 (100%)	20	546	447	68%	18.1%
Prince Edward Island	5 500	883	Email, telephone	50	19 (38%)	1	5 045	4 235	92%	16.1%
Nova Scotia	26 323	3198	Email	44	19 (43%)	50	16 288	14 309	62%	12.2%
New Brunswick	12 963	1706	Mail, email, fax, telephone	32	23 (72%)	50	9 788	8 500	76%	13.2%
Quebec	55 508	10555	Online	118	68 (58%)	50	32 275	26 138	58%	19.0%
Ontario	96 799	17193	Online, telephone	252	90 (36%)	50	42 467	34 924	44%	17.8%
Manitoba	118 697	18299	Email, online	166	44 (27%)	50	48 045	40 638	40%	15.4%
Saskatchewan	100 000	13707	Online	363	129 (36%)	50	59 203	51 088	59%	13.7%
Alberta	288 320	91843	Online	169	83 (49%)	100	165 323	112 660	57%	31.9%
British Columbia	57 313	18444	Online	257	86 (33%)	25	19 981	13 551	35%	32.2%
CANADA	**762 223**	**175 974**		**1 463**	**573 (39%)**		**398 961**	**306 490**	**52%**	**23.2%**[1]

[1] This number is the total loss calculated over all colonies in Canada.

Table 2: Overwintering method by province as reported by responding beekeepers - Fall 2020.

Province	Outdoors		Indoors	
	Number of colonies	Percent (%)	Number of colonies	Percent (%)
NFL	546	99	3	1
PEI	4 764	94	281	6
NS	3 954	24	12 334	76
NB	4 808	49	4 980	51
QC	9 761	30	22 514	70
ON	29 470	69	12 997	31
MB	22 678	47	25 367	53
SK	48 298	82	10 905	18
AB	137 587	83	27 736	17
BC[a]	58 232	100	0	0
Canada	**319 552**	**73**	**117 114**	**27**

[a] Includes AB colonies overwintered in BC

Table 3: Indoor and outdoor wintering mortality as reported by responding beekeepers.

Province	Outdoors			Indoors		
	Total numberof colonies infall 2020	Total numberof viable colonies in spring 2021	Percent of losses of colonies (%)	Total numberof colonies infall 2020	Total number of viable colonies in spring 2021	Percent losses of colonies (%)
NFL	546	447	18.1	3	3	0.0
PEI	4 764	4 010	15.8	281	225	19.9
NS	3 954	3 453	12.7	12 334	10 856	12.0
NB	4 808	4 140	13.9	4 980	4 360	12.4
QC	9 761	7 916	18.9	22 514	18 222	19.1
ON	29 470	23 278	21.0	12 997	11 646	10.4
MB	22 678	19 693	13.2	25 367	20 945	17.4
SK	48 298	42 564	11.9	10 905	8 524	21.8
AB	137 587	93 580	32.0	27 736	19 080	31.2
BC	58 232	39 598	32.0	0	-	-
Canada	**319 552**	**238 232**	**25.4**	**117 114**	**93 858**	**19.9**

Contributing factors as cited by beekeepers

Beekeepers were asked to rank possible contributing factors to colony mortality. These responses are summarized in Table 4. Poor queens, weak colonies in the fall and ineffective varroa control were considered the most important factors for winter loss across the country.

Poor queens were reported as either the primary or second most common factor contributing to reported winter losses in nine provinces. Poor queens can result in weakened colonies entering the winter with an insufficient number of bees to survive. If a queen becomes infertile or dies during the

winter, the colony will also perish as there is no opportunity for the beekeeper to replace the queen or for the colony to naturally re-queen itself. Poor and failing queens may be the result of many factors including: inadequate rearing conditions, poor mating weather, reduced sperm viability, queen age, or exposure to pesticides within the hive or from the environment. This marked increase in poor queen quality as a reported cause of winter mortality is a concern that merits further investigation.

Another contributing factor identified in nine provinces, most frequently in second rank, was weak colonies in the fall. This can be caused by a variety reasons including: making late splits (nuclei) (as was reported by Newfoundland/Labrador beekeepers), underlying pest and disease issues, exposure to pesticides, or poor foraging and nutrition.

Ineffective varroa control was reported as the first possible contributing factor to winter colony loss in three provinces, which were also the three provinces with the highest mortality rates. While the varroa mites and their impacts on the honey bee health are still a serious issue for Canadian beekeepers, survey results indicate that most beekeepers are monitoring at least once a year and treating for varroa using multiple treatments per year. Unfortunately, some individual producers monitor and treat for varroa too late in the season when varroa levels are already at levels where damage to the colony will occur. This results in wintering bees being less healthy from the impacts of varroa and associated viruses. Monitoring is becoming increasingly important when the efficacy of treatments varies either through environmental factors such as cold temperature (the efficacy of some treatments is dependent on temperature (e.g., formic acid and thymovar)) or the development of resistance to treatments (e.g., fluvalinate (Apistan) and coumaphos (CheckMite+)). Monitoring varroa levels before and after treatment, selecting suitable effective treatments and verifying treatment efficacy are all necessary elements of an effective management strategy for this economically-important pest.

Starvation was reported as a cause of winter mortality by beekeepers in several regions across Canada. Starvation can result from the inability of bees in weak colonies to store enough food during the fall, the inability of bees to move to new resources within the hive during winter, the rapid consumption of stored food because of early brood production, or insufficient feed provided by the beekeeper in the fall or spring. During 2020-21, starvation may also have been associated with increased consumption of stored honey or sugar syrup during the extended cold weather in the spring of 2021 in some areas.

Some beekeepers reported that they did not know why their colonies perished, although this answer was not identified among the top four causes for losses among most provinces. Inability to identify a possible cause for colony mortality may be associated with lack of applying best management practices including monitoring for pests, diseases and other general colony health parameters during the season, or a multitude of underlying problems that cannot be identified without the assistance from specialists.

Table 4: Top four ranked possible causes of honey bee colony mortality by province, as cited by beekeepers who responded to the 2020-2021 winter loss survey

Province	**1st.**	**2nd.**	**3rd.**	**4th.**
NL	Weak colonies in the fall	Poor queens	Starvation	Other
PEI	Poor queens	Weak colonies in the fall	Don't know	Ineffective Varroa control
NS	Poor queens	Weak colonies in the fall	Starvation	Don't know

NB	Don't know	Poor queens	Weather	Weak colonies in the fall
QC	Ineffective Varroa control	Poor queens	Weak colonies in thefall	Weather
ON	Poor queens	Weak colonies in thefall	Ineffective Varroa control	Weather
MB	Poor queens	Weak colonies in thefall	Starvation	Weather
SK	Poor queens	Weak colonies in the fall	Starvation	Ineffective Varroa control
AB	Ineffective Varroa control	Poor queens	Nosema	Weather
BC	Ineffective Varroa control	Weak colonies in the fall	Starvation	Weather

Operations that reported greater than 25% winter losses were asked to rank the top four possible causes of bee colony mortality in the 2020-2021 survey. These data are summarized in Table 5. Poor queens, weak colonies in the fall and ineffective varroa control remain the 3 most-cited causes of winter loss. Overall, there were no striking differences between reported causes of winter losses across the provinces and for those operations that reported 25% or more losses.

Table 5: Top four ranked possible causes of bee colony mortality by province, as cited by beekeepers who reported greater than 25% losses in the 2020-2021 winter loss survey

Province	**1st.**	**2nd.**	**3rd.**	**4th.**
NL[a]	N/A	N/A	N/A	N/A
PEI	Poor queens	Weak colonies in the fall	Ineffective Varroa control	Other
NS	Poor queens	Weak colonies in thefall	Don't know	
NB	Poor queens	Don't know	Weather	Starvation
QC	Ineffective Varroa control	Weather	Poor queens	Other
ON	Ineffective Varroa control	Poor queens	Weather	Don't know
MB	Weak colonies in thefall	Poor queens	Starvation	Ineffective Varroa control
SK	Ineffective Varroa control	Poor Queens	N/A	N/A
AB	Ineffective Varroa control	Poor queens	Nosema	Weak colonies in thefall
BC	Ineffective Varroa control	N/A	N/A	N/A

[a] No beekeeper reported losses greater than 25%.

COVID-19 impact on winter mortality as cited by beekeepers

The pandemic brought numerous additional problems to the beekeeping industry in 2020, beyond the simple risk of contracting COVID-19 and falling ill. With international flights delayed and cancelled, there were issues importing queens and bee packages. Temporary foreign workers were faced with difficulties getting visas, travel arrangements, entering the country, and quarantining. Some supplies, such as sugar, were limited in supply. Travel restrictions were imposed in and among some provinces or regions.

Surveyed beekeepers were asked to score the impact of COVID-19 related issues on winter mortality on a scale of 1 to 10, with 1 being no impact and 10 being a major impact. Respondents reporting a high impact (6 and above) were asked to rank the issues having impacted their mortality. The results are presented in Table 6.

Table 6: Impact of COVID-19 related issues on winter mortality as cited by the respondents of the 2020-2021 winter loss survey

Province	Mean score of covid impact on mortality (on scaleof 1 to 10)	Median score of covid impact on mortality (on scaleof 1 to 10)	For beekeepers that reported an important impact of COVID-19 onwinter mortality (scores of 6 and above)		
			1st ranked issue	2nd ranked issue	3rd ranked issue
NL	2.50	1.00	Other	Access to labour (ex: temporary foreign worker)	Movement restrictions(e: between regions or provinces)
PEI	2.00	1.00	N/A	N/A	N/A
NS	1.30	1.00	Movement restrictions (ex: between regions or provinces)	Access to labour (ex: temporary foreign worker)*	Access to bees (queens, packages of bees, etc.)*
NB	1.65	1.00	Access to bees (queens, packages of bees, etc.)	N/A	N/A
QC	2.15	1.00	Access to bees (queens, packages of bees, etc.)	Access to necessary supplies for beekeeping management (ex: syrup)	Access to labour (ex: temporary foreign worker)
ON[a]	-	-	Access to necessary supplies for beekeeping management (ex: syrup)	Access to bees (queens, packages of bees, etc.)	Access to labour (ex: temporary foreign worker)
MB	1.50	1.00	Access to labour (ex: temporary foreign worker)	Access to necessary supplies for beekeeping management (ex: syrup)	Access to bees (queens, packages of bees, etc.)

SK[b]	-	-	Access to labour(ex: temporary foreign worker)	N/A	N/A
AB	3.00	1.00	Access to labour (ex: temporary foreign worker)	Access to bees (queens, packages of bees, etc.)	Access to necessary supplies for beekeeping management (ex: syrup)
BC	-	-	-	-	-

* Issues ranked equally.

[a] Ontario beekeepers were asked whether they encountered the listed issues related to COVID-19, and not to score the impact of the pandemic.

[b] In Saskatchewan, 6 beekeepers stated that COVID-19 affected mortality (without score).

In general, COVID-19 related issues had a low impact on winter losses. In each province, respondents gave the impact an average score below 3 out of 10. The median[2] answer for all provinces was 1, meaning that at least half the respondents saw no impact of the pandemic on their winter losses.

The most frequently reported issues related to COVID-19 having had an important impact on winter losses were access to labour, access to bees and access to supplies. Movement restrictions (e.g., between regions or provinces) and illness (e.g., workers, family, etc.) were not reported as having had an important impact on winter losses.

Bee Pest Management Practices

In recent years, Integrated Pest Management (IPM) has become the most important practice to maintain healthy honey bees. To successfully manage bee health, beekeepers must identify and monitor pests and diseases to take timely action in accordance with approved methods. This survey focused on asking beekeepers questions about their management of three serious threats that may impact bee health, survivorship and productivity (Appendix B).

A. Varroa monitoring and control[3]

The varroa mite continues to be considered by beekeepers and apicultural specialists as one of the main causes of honey bee colony mortality.

During the 2020 production season, a large majority (50 to 87% depending on the province) of surveyed beekeepers monitored for varroa mite infestations at least once a year (Table 7). The alcohol wash of a sample of 300 bees per colony was the most preferred technique in all provinces, except Quebec where beekeepers favoured the use of sticky boards and British Columbia where beekeepers preferred the technique using icing sugar to dislodge mites from bees. The frequency of use for the alcohol wash technique in various provinces ranged from 31% to 80%. The frequency of use for the

[2] The median is the middle number in a sorted, ascending or descending, list of numbers. In a skewed distribution (i.e.: when there are outliers in the sequence that might skew the average of the values), it can be more descriptive of that data set than the average.

[3] Although data is presented for this province, it must be reminded that no varroa mites are found in Newfoundland and Labrador.

sticky board method ranged from >1% to 55%. Some beekeepers used both sticky boards and alcohol wash methods to evaluate levels of mites. These results demonstrate that most Canadian beekeepers recognize the value of monitoring varroa. Nevertheless, the desired goal is to have **all beekeepers** regularly monitoring varroa populations throughout the beekeeping season, particularly at times prior to treatment application windows, and subsequent to treatment to verify efficacy. Such sampling will ensure optimal timing of

treatments and selection of the most effective treatment options for varroa control. While education and extension programs delivered to Canadian beekeepers have facilitated the adoption of recommended practices for managing varroa, ongoing innovation and improvement must continue.

Table 7: Varroa monitoring methods as cited by the respondents of the 2020-2021 winter loss survey.

Province	Beekeepers screening for varroa mites (%)						
	Technique		Frequency				
	Sticky boards	Alcohol wash	No monitoringor no response	Only in fall	Only in spring	In spring and fall	3 times a year and more
NL[a]	<1	73	48	13	<1	38	<1
PEI	16	42	15	6	26	26	27
NS	16	53	31	5	32	16	16
NB	17	57	13	4	39	22	22
QC	55	36	35	6	18	22	19
ON	18	63	16	8	11	27	38
MB	11	68	19	5	14	51	11
SK	12	77	19	-	-	81	-
AB	20	70	10	12	2	23	53
BC	26	31	-	-	-	-	-

[a] No varroa mites are found in Newfoundland and Labrador.

In Canada, there are a variety of registered miticides available to beekeepers for mite control. Beekeepers are encouraged to use the most effective miticide that fits their region, season and operation. Beekeepers are also encouraged to rotate miticides to prevent the development of resistance to these products. In the current survey of bee winter losses, beekeepers were asked “what chemical treatment was used for varroa control during the 2020 season”. Beekeepers’ responses are summarized in Table 8. In the spring of 2020, the percentage of beekeepers that treated with chemical methods ranged from 56% to 98% in provinces where the mite is present. In provinces with lower treating rates like Quebec (56%) and New Brunswick (57%), this means that the most common scenario in spring is actually the absence of treatment. For Canadian beekeepers who did treat in the spring, the main miticide used for spring varroa control was Apivar® (active ingredient: amitraz). The second most common treatment was formic acid in various forms, followed by oxalic acid. In fall of 2020, most Canadian beekeepers (71% to 100% depending on province) treated their colonies for varroa. The main miticides used at this time of the year were oxalic acid, Apivar® and formic acid. It was noted that some beekeepers used Apivar® twice in the same year in 2020, once in spring and again in fall. In some provinces, a greater number of beekeepers have started to combine Apivar® with formic or oxalic acid during the fall for keeping control of mite populations. As varroa is not present in Newfoundland and Labrador, no treatments were required in that province.

Few beekeepers used Apistan® (a synthetic miticide with the active ingredient fluvalinate) or Checkmite+® (a synthetic miticide with the active ingredient coumaphos). Beekeepers may be wary of these products because of previously reported resistance to these active ingredients in Canada. Bayvarol® (a synthetic miticide with the active ingredient flumethrin) was also rarely used; there have been concerns and reports from beekeepers about the limitations in the efficacy of this product, which have been confirmed by research projects in Canadian provinces.

Once again, these surveys show that Apivar® is one of the most commonly used miticides for treating varroa in Canada. Because of the repeated use of Apivar®, it is only a matter of time before the development of resistance to this miticide. Preliminary findings of decreased efficacy have been observed in some provinces.

It is becoming increasingly important that beekeepers become aware of the principles associated with resistance development and the importance of monitoring the efficacy of all treatments, in particular Apivar®. This will help to mitigate abrupt and widespread failures of treatments. Beekeepers are encouraged to incorporate resistance management practices such as using appropriate thresholds for treatment, following the label instructions, never leaving treatments in the hive beyond the appropriate treatment period or reusing chemical strips, and alternating miticides with different modes of action in their varroa treatment programs. Good biosecurity and food safety practices will also promote healthy bees and safe, high quality hive products while reducing disease pressure. In addition, having a wide suite of legally registered treatments with different functional activities and methods of application available to beekeepers is critical for maintaining a sustainable integrated varroa management strategy in Canada.

Table 8: Varroa chemical control methods as cited by the respondents of the 2020-2021 winter loss survey. Chemical treatment is in order from most to least commonly used.

Provinces	Varroa control: treatment and methods			
	Spring 2020		Summer/Fall 2020	
	% of beekeepers	Methods of treatment	% of beekeepers	Methods of treatment
NL[a]	0	N/A	0	N/A
PEI	79	Apivar (amitraz), 65% formic acid – 40 ml multiple application, Bayvarol (flumethrin)	100	Oxalic acid, Formic Pro (formic acid), Apivar (amitraz)
NS	84	Apivar (amitraz), Apistan (fluvalinate), 65% formic acid – 40 ml multiple application	84	Apivar (amitraz), Formic Pro (formic acid), Oxalic acid
NB	57	Apivar (amitraz), Formic Pro (formic acid), Oxalic acid	100	Apivar (amitraz),Oxalic acid, Formic Pro (formic acid)
QC	56	65% formic acid – 40 ml multiple application, Apivar (amitraz), 65% formic acid – 250 ml single application	97	65% formic acid – 40 ml multiple application, Oxalic acid, Apivar (amitraz)
ON	79	Apivar (amitraz), 65% formic acid – 40 ml multiple application, Oxalic acid	96	Apivar (amitraz),Oxalic acid, Formic Pro (formic acid)
MB	86	Apivar (amitraz), Oxalic acid, Formic acid (no distinction between products)	94	Oxalic acid, Apivar (amitraz), Formic acid (no distinction between products)
SK	98	Apivar (amitraz), Oxalic acid, Formic acid (no distinction between products)	71	Apivar (amitraz),Oxalic acid, Formic acid (no distinction between products)
AB	79	Apivar (amitraz), Oxalic acid, 65% formic acid – 40 ml multiple application	95	Oxalic acid, Apivar (amitraz), 65% formic acid – 40 ml multiple application
BC	72	Formic acid (no distinction between products), Apivar (amitraz), Oxalic acid	90	Formic acid (no distinction between products), Oxalic acid, Apivar (amitraz)

[a] No varroa mites are found in Newfoundland and Labrador.

B. Nosemosis management practices

Nosema is a fungal parasite that infects honey bees. Nosema ceranae has gradually replaced Nosema apis to become the most frequently found nosema species in Canada. The real role of N. ceranae in honey bee colony survival during winter may vary by climatic region and bee populations in Canada. More recently, several Canadian studies from central Canada have demonstrated that N. ceranae did not impact winter mortality, however the parasite was found to potentially impact the development of honey bee colonies in early spring (Emsen et al., 2016; Emsen et al., 2020; Guzman et al., 2010; Punko and Rosanna, 2021). It was not cited by Canadian beekeepers in this survey as a possible cause of colony mortality during the 2020-2021 winter loss survey, except in Alberta.

In the survey, beekeepers reported the use of fumagillin for the treatment of nosemosis in spring and/or in fall of 2020 (Table 9). The percent of beekeepers that reported using this drug varied widely from province to province. Beekeepers were also asked to report all alternative treatments that they used during the spring or the fall to control nosemosis. Fumagilin-B® is the only product registered by Health Canada for nosema treatment. Any other products mentioned by beekeepers are not currently registered for the treatment of this disease, though some are marketed and used as general promotors of honey bee health. It is also worth noting that there are some regions of Canada where Fumagilin-B® is not used by most beekeepers. This may be due to the recent research in Canada clarifying the impacts of nosema on winterloss, research on new active ingredients by Canadian researchers, and biosecurity practices (i.e. replacement of brood comb) that are promoted to complement the use of treatments. Nosemosis is still an issue impacting bee health and further research is required to understand its role in colony or production loss throughout Canada.

Table 9: Antibiotic (fumagillin) and alternative treatments for nosemosis as cited by the respondents of the 2020-2021 winter loss survey

Province	Use of antibiotic and alternative treatments for nosemosis (% of respondents)					
	Spring treatment			Fall treatment		
	Fumagillin	Other product	main alternative products	Fumagillin	Other product	main alternative products
NL	<1	0	N/A	<1	0	
PEI	11	0	N/A	16	0	N/A
NS	37	5	Hive alive	37	16	Hive alive, Lemongrass
NB	17	0	N/A	26	0	N/A
QC	2	0	N/A	3	6	Apple cider vinegar
ON	4	1	N/A	8	1	N/A
MB	10	12	N/A	12	10	N/A
SK	33	9	Prebiotics, Probiotics	39	12	Prebiotics, Probiotics
AB	33	5	Bee pro, Nosevit,Pro health	57	3	Nosevit

BC	16	-	-	13	-	-

C. American foulbrood management practices

American foulbrood (AFB) is a bacterial disease of brood caused by Paenibacillus larvae. AFB is considered endemic in Canada. It is also of great concern to beekeepers as active infections may result in large-scale loss of honey bees and equipment and can spread within regions if proper steps are not taken to eliminate infective honey bee colonies and equipment. Oxytetracycline and more recently tylosin and lincomycin are antibiotics registered for treating AFB in Canada. The pattern of use for these antibiotics, as reported by beekeepers, is presented in Table 10. Oxytetracycline was more frequently used by beekeepers in spring and fall than other treatments. Provincial recommendations on antibiotic use (e.g., prophylactic vs curative) vary, therefore treatments may be or may not be reflective of active infection depending on the province.

Table 10: Antibiotic treatments for American foulbrood (oxytetracycline, tylosin and lincomycin) as cited by the respondents of the 2020-2021 winter loss survey

Province	Use of American Foulbrood Treatments (% of respondents)					
	Spring treatment			Summer/Fall treatment		
	Oxytetracycline	Tylosin	Lincomycin	Oxytetracycline	Tylosin	Lincomycin
NL	0	0	0	0	0	0
PEI	5	0	0	0	0	0
NS	21	0	0	5	0	0
NB	43	0	0	22	0	0
QC	6	0	0	3	0	0
ON	61	0	0	52	1	0
MB	46	0	0	31	12	0
SK	41	0	0	36	4	0
AB	15	4	1	15	6	0
BC	8	0	0	4	2	0

In the recent years, some beekeepers have reported increasing impact of and difficulty controlling European foulbrood (caused by Melissococcus plutonius) in their operation. Oxytetracycline, although typically used as a treatment for AFB, has started being used specifically to treat overt EFB outbreaks. This year, surveyed beekeepers were asked if they used oxytetracycline for the treatment of EFB (Table 11). In most provinces, the numbers reported coincide with those for oxytetracycline treatment of AFB, which suggests that beekeepers probably use this product in prevention for both diseases, or did not confirm diagnostic before treating overt infections. However, in Alberta, where prophylactic use is not recommended, the number of beekeepers having treated with oxytetracycline for EFB in the fall is double the number of beekeepers having treated with oxytetracycline for AFB.

Table 11: Antibiotic treatments for European foulbrood (oxytetracycline) as cited by the respondents of the 2020-2021 winter loss survey

Province	Use of European Foulbrood Treatments (% of respondents)	
	Spring treatment	Summer/Fall treatment
	Oxytetracycline	Oxytetracycline
NL	0	0

PEI	5	0
NS	11	0
NB	39	22
QC	6	3
ON	43	43

Honey Bee Winter Loss and Population in Canada Since 2007

Reported winter loss has been variable from year to year in Canada since 2007. This year, the reported Canadian winter mortality averaged 23.2%. This is higher than the long-term suggested baseline/ threshold for winter losses of 15%. In fact, since the beginning of this survey in 2007, this suggested acceptable threshold has never been reached for the Canadian average. As can be seen in Figure 1, the national winter losses were highest in 2008, 2009 and 2018 which ranged from 32.6% to 35.0%. From 2007 to 2021, the national winter losses ranged from 15.3% to 32.6%, averaging 25.8%. During the period between 2007 and 2020 Statistics Canada reports showed that the total colonies in Canada increased by 26.7%.

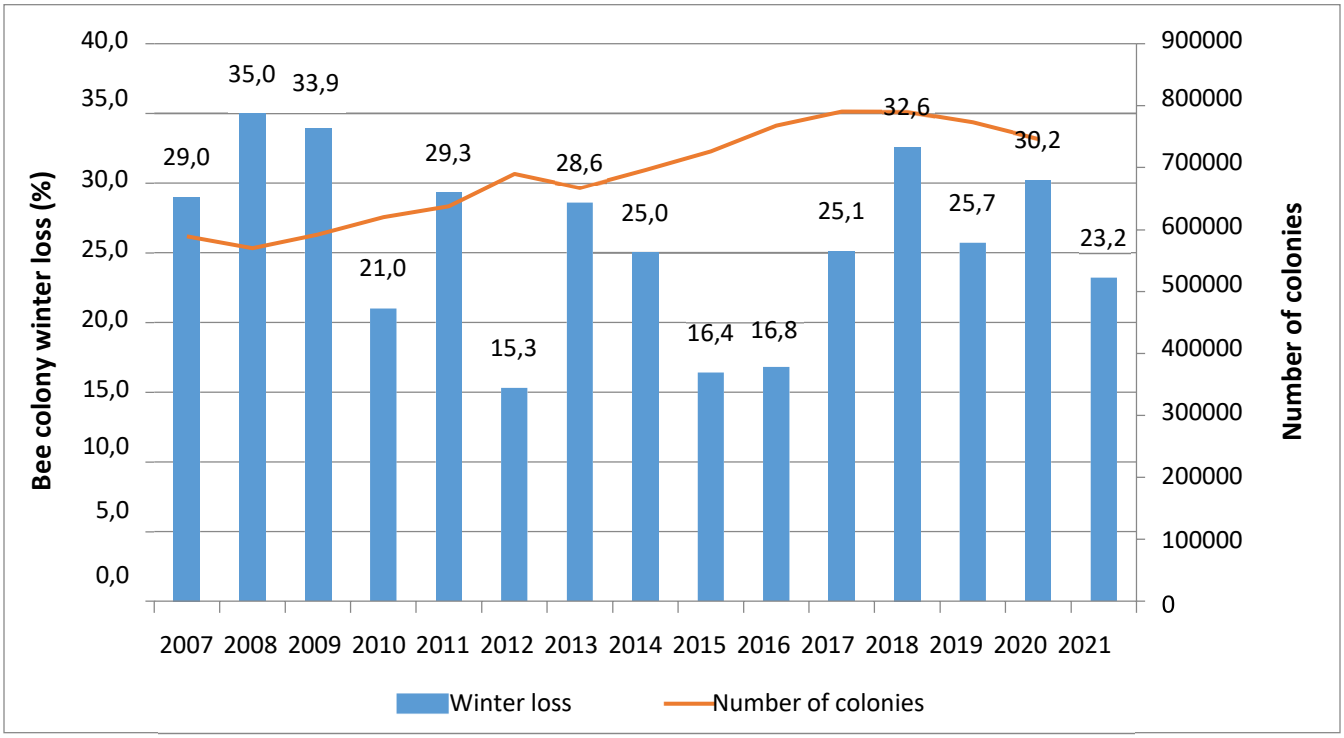

Figure 1. Summary of bee colony numbers and bee losses in Canada from 2007-2021 (based on data as reported by Stats Canada). Note that the number of colonies as reported by Stats Canada is not available for the current year.

Overall, there is more to these opposing trends than the graph may highlight. High levels of colony winter mortality are still a threat to the sustainability of the beekeeping industry in Canada. Beekeepers must be vigilant and practice expert pest management for serious pests endemic to the honey bee population in Canada (e.g. varroa mites), with little room for error.

Individual beekeepers experiencing high winter losses face considerable expenses replacing dead colonies. These increased expenses greatly affect profitability and productivity and can put some beekeeping

operations at risk of going out of business. As well, this survey and report do not take into account mid-season losses of honey bee colonies or queens that beekeeper may be experiencing through the beekeeping season. Nevertheless, the Canadian beekeeping industry as a whole has been resilient and able to grow, as proven by the overall increase in the number of bee colonies since 2007 (Figure 1) despite the difficulties faced every winter. While provincial estimates demonstrate regional trends in the overall winterloss, within each province the results vary between different regions and beekeeping operations with some experiencing greater or lower losses than the provincial average. Both of these extremes demonstrate that while there are operations that have been highly successful, the risks of losing large proportions of colonies is still present in Canada, and continued vigilance is required to maintain bee health and profitable beekeeping operations.

Bee health concerns include pest management, climatic conditions, nutrition, and pesticide exposure within hives and from the environment. Another added challenge facing beekeepers is the economics of beekeeping which include variable honey prices and increasing costs of production. Even though responses from this annual survey have provided evidence that some beekeepers are using recommended practices for monitoring and managing honey bee pests and diseases, there are always the opportunities to make further improvements. As such, the detailed management data from beekeepers summarised in this report has been used by some apiary and extension programs to focus education, training, and communication efforts to beekeepers in improvement in management for honey bee pests.

It would appear that stresses caused by parasites in combination of other stressors warrant further study to provide alternative management practices for maintaining honey bee health. At this time, beekeepers have a limited number of products to control varroa, and all of these options have their limitations. New options are important to mitigate the risk of developing resistance. Additionally, the only product registered for the treatment of nosema is fumagillin. If resistance develops to the primary treatment for varroa (Apivar®) or to fumagillin, beekeepers could experience even greater – and likely extreme – difficulties keeping their bees alive. Ultimately, beekeepers will need more effective and additional options (miticides, antibiotics and non-chemical management options) in their “tool box” if they are to continue effective integrated pest management to maintain healthy bees.

Further Work

CAPA members continue to work closely with industry stakeholders, and provincial working groups to address bee health and industry economics. Members of CAPA and Provincial Apiarists have also been involved in conducting surveillance programs at the provincial levels and across the country to monitor the status of bee health including emerging pests. CAPA members, the Provincial Apiarists, and Technology Transfer Programs are involved in conducting outreach and extension programs to promote IPM and biosecurity practices to beekeepers. Researchers within

CAPA are active in evaluating alternative control options for varroa mites and nosema and developing genetic stocks more tolerant to pests which will enhance the integrated pest management (IPM) practices and address honey bee health sustainability.

For more information about this report, please contact:

Dr. Gabrielle Claing, Cochair of the CAPA National Survey Committee gabrielle.claing@mapaq.gouv.qc.ca Tel: 450 778-6542 Ext. 5894

Dr. Julie Ferland, Cochair of the CAPA National Survey Committee Julie.Ferland2@mapaq.gouv.qc.ca Tel : 418 380-2100 Ext. 2067

Dr. Shelley Hoover, President of Canadian Association of Professional Apiculturists (CAPA) s.hoover@uleth.ca
Tel: 587 220-3775

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MOTION: **Motion to accept the National Survey Report as presented.**
MOVED BY: **Paul Kozak**
SECONDED BY: **Martine Bernier**
CARRIED

CAPA – Core Winter loss survey questions (2021) and list of Canada's Provincial Apiarists is available in Appendix 3.

Importation and Bee Movement Report
Paul Kozak and Samantha Muirhead

CAPA Bee Importation and Movement Committee 2021 Report

Paul Kozak (Ontario Provincial Apiarist) and Samantha Muirhead (Alberta Provincial Apiarist)

Membership:

- Paul Kozak (Ontario Provincial Apiarist) Co-Chair
- Samantha Muirhead (Alberta Provincial Apiarist) Co-Chair
- Robert Currie (University of Manitoba)
- Ernesto Guzman (University of Guelph)
- Graham Parsons (Government of Saskatchewan, Ministry of Agriculture)
- Les Eccles
- Nuria Morfin-Ramirez (University of Guelph, OMAFRA)
- Olivia de Herdt (Alberta, Apiculture Technician)

All other Provincial Apiarists officio – with the exception of Saskatchewan:

- Paul van Westendorp (BC)

- Rhéal Lafrenière (MB)
- Julie Ferland / Gabrielle Claing (QC)
- Chris Maund (NB)
- Jason Sproule (NS)
- Cameron Menzies (PE)
- Karen Kennedy (NL)

Sam and Paul have aimed to focus on facilitating the ideas, concerns and goals brought forward by the committee members, partners in the Canadian Food Inspection Agency, Canadian Honey Council, other industry members and the CAPA Executive Committee. The membership of the committee includes a great deal of scientific, regulatory and policy expertise and has collectively formed the options, and recommendations provided by the committee. The committee has also networked with the CAPA Africanized Honey Bee Committee for further scientific and technical expertise and flagged major issues for awareness and comment to the CAPA Executive Committee.

Communication Structure:

The Co-chairs communicate directly with Connie Rajzman (Senior Veterinary Officer with the CFIA) on requests for technical information from the committee. These are relayed back to the committee for comment. Major, and general developments are regularly reported to the committee, the CAPA Executive Committee, the Canadian Honey Council (CHC) (Rod Scarlett - Executive Director; President and Communications Chair may also be included) and with Provincial Apiarists outside of the committee (SK). The CAPA Executive may also be consulted on high priority or contentious items as the need arises.

Imports and Shipments of Queens and Packages into Canada during spring 2021:

For statistics on Imports into Canada see the AAFC National Statistical Trends in Honey, Beekeeping and Pollination report.

Although it was believed that delivery issues stemming from covid-19 from 2020 had been remedied, in 2021 the importation of packaged bees coming into Canada was once again hindered. Due to live animal transportation issues, where because of covid-19, flights, and air crafts suitable for package transportation were limited from New Zealand and Australia. Resulting in only a small number of packaged bees making it into Canada.

Packaged bees were able to make it in from Chile but only through indirect flights where planes had to fly to Amsterdam then to Canada. These long flights (including siting on tarmacs waiting for continuing flight) resulted in packages arriving in poor condition or dead.

Once again, the industry association CHC took the lead in speaking directly with exporters, airlines, and government. There were meetings with government staff that included Agriculture and Agri-Food Canada and the Airlines.

The CAPA Bee Importation and Movement Committee's communicated with the CHC and were available to assist where needed. However, there was little work done by the committee and the industry (CHC) accomplished most of this through their own work

California Queens and Africanized Honey Bees (AHB):

In early 2019 the committee met on numerous occasions to discuss the 100 mile exclusion zone in California which was created to prevent the introduction of AHB into Canada. A major development was the increase in distribution and spread of AHB in California, reported in a recent research paper (Lin et al., 2018). Key issues were AHB being detected within this zone, the implications of shrinking the exclusion zone, the distribution of queen producers and AHB in California in relation to the zone, methods used to test AHB, other options for exclusions zones, and California's inspection, sampling process, and surveillance AHB program. For more information see 2019 and 2020 Bee Importation Movement and Committee (BIMC) reports.

In 2020, CFIA gave an exemption for queens to be imported into Canada that were within the 50 mile exclusion zone for AHB in California (See 2020 BIMC report). This incident shut down Canada's border to queens from mainland USA until the exemption was made. As a result, the BIMC was contacted by CHC, requesting information and a plan to help prevent a border closure if and when there is another incursion of AHB in the exclusion zone. At this time, the BIMC will have to consult within the membership, with the AHB Committee and Provincial Programs to determine the scope and timing of the work required.

California Queens ease of Importation Requirements

In January 2021, the CHC stock replacement committee had a meeting with California Queen Producers to discuss issues surrounding California Queen Importation into Canada. One potential issue identified by beekeepers was with timelines and the perception that it is difficult to meet Canada's requirements within the allowed timeline. However, it appears that majority of the concerns need to be addressed on the producer's end, through California State Officials and the USDA, and must be based on the appropriate agencies responsible for which steps in the process. To help ease the time constraint on Canada's end, the CHC put in a request to the CFIA to extend the certificate validity period for queens coming from the US from 30 to 90 days as many queen shipments from California don't make it because the certificate "just expired". The CFIA consulted with the CAPA BIMC committee and proposed the period be extended to 45 days. This was based on a review of numerous options and took into account risks associated with honey bee pests and diseases as well as the process for regulators and producers. This new time-line has yet to be implemented.

Small Hive Beetle in international Imports:

After a single SHB was found in a queen shipment brought into Manitoba in 2020 (see 2020, BMIC report), the CFIA, and the Manitoba Provincial Apiculturist, Rhéal Lafrenière, worked with the queen producer to ensure all steps were being properly followed to prevent another incident. In 2021, there were no reports of SHB found in queen shipments.

Continued Closure of the Canada / USA Border – Queens Imported from Canada to the USA:

On September 4, 2019, the CFIA received confirmation from the United States Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) that the U.S. border was officially closed to honey bees being exported from Canada. Prior to the border closure, Canadian beekeepers could export honey bee queens to the USA. For details please refer to the 2019, and 2020 BIMC reports.

Currently, there has been no progress on this issue or clarity from the USDA as to why the border was and continues to be closed. The BIMC continues to reach out to CFIA on this issue.

Movement across Canada:

In December 2020, CHC initiated discussions with the Provincial Apiarists about the need to harmonize requirements and protocols for inspections and movement across Canada. This is an ongoing dialogue (this has been going on for quite a number of years).

Overall, Provincial Apiarists agree that each province is dealing with its own disease and pest pressures, differing regulations, etc. As well, the policies and protocols of each province evolve in light of Ministry / department program adjustments, changes in pest and disease status, available staff, etc. This makes creating a harmonized document difficult and would most likely result in an overly cumbersome harmonization document in order to meet the interprovincial conditions for each province. As a compromise, in 2020, the BIMC asked every province for a summary of their interprovincial movement guidelines including primary contacts, government websites, inspection requirements, special conditions and requirements, etc. A document that summarizes the requirements of each province has been produced and is awaiting a final review. The intent is to give this information to the CHC and the provincial beekeeping associations so that they will have on hand all the requirements of each province making it easier for beekeepers to find the information required to move bees/equipment/queens interprovincially.

Considerations carried forward from the 2020 report:

- Are there issues of logistics that this committee can address in future work? i.e. transportation of bees (standards, protocols)
- There is ongoing risk of pest and diseases from other countries and regions of the world. This includes some of the largest suppliers of bees to Canada. (USA for AHB and amitraz resistant varroa; Australia for tropilaelaps).
- Is it time for CAPA, CHC, etc.to take a strategic approach to sustainability and production of honey bees within Canada?
- Is it time to seek further information on protocol from some of these countries such as the USA as well as increase our collaboration in information gathering and perhaps developing mitigations (particularly by working with organizations like the Apiary Inspectors of America)?
- Is the pest and disease information collected and documented by the provincial Apiary Programs, and various research projects, and often summarized by CAPA being used in the best way possible by the CFIA, the World Organisation for Animal Health (OIE) and trading partners?

Discussion: The members discussed the possibility of CAPA to support a project on sustainability of the Canadian beekeeping industry, and the possibility of an action item for the new executive to consider forming CAPA Sustainability committee.

MOTION: **Motion to accept the Importation Report as presented.**
MOVED BY: **Medhat Nasr**
SECONDED BY: **Jason Sproule**
CARRIED

IPM Report
Jason Sproule

2021 CAPA Integrated Pest Management Report

Committee Co-chairs: Jason Sproule, Nuria Morfin

Members: Chris Maund, Colette Mesher, Derek Micholson, Gabrielle Claing, Graham Parsons, Les Eccles, Jason Sproule, Julie Ferland, Medhat Nasr, Nicolas Tremblay, Nuria Morfin, Paul Kozak, Rassol Bahreini, Renata Borba, Rhéal Lafrenière , Sam Muirhead, Steve Pernal, Tom Thompson, Valerie Fournier.
IPM Committee meetings were held virtually in April and October of 2021 with regular electronic communication as needed.

Mission and Vision statements.
The Committee discussed the need to set boundaries and present a clear focus for the work the IPM Committee will engage in. A document outlining what members agreed should be the Vision, Mission, Mandate and Scope of the Committee was drafted in the hope that these would inform the projects the Committee undertakes and provide continuity between leadership changes. At this time of this report the document is ready to be submitted to the CAPA Executive for review.

Oxalic acid label expansion

The Committee continues to work on a request from Canadian Honey Council (CHC) to assist with the registration of an additional oxalic acid (OA) formulation with Pest Management Regulatory Agency (PMRA) for management of *Varroa* mites. CHC already holds registration with PMRA for OA to be applied in hives as a sugar solution (trickle method) or by vaporizer. Recent research from Ontario's Technology Transfer Program has shown good efficacy when OA is combined with glycerine and applied as an impregnated cellulose strip, resulting in a delayed and sustained release of the active ingredient. Similar trials in Canada, the US and Argentina conducted using either cellulose strips or the "shop towel" method also demonstrate efficacy. The Pre-Submission Consultation Process with PMRA will determine the 1) eligibility of the request to register the new use and 2) data requirements needed for registration. The Committee has worked to collect or prepare the necessary documents to initiate a Pre-Submission Consultation including: a draft label for the new OA formulation, cover letter from a Provincial Minor Use Coordinator (PMUC) and a letter of support from the registrant (CHC). Laura Anderson, Nova Scotia PMUC, has agreed to submit the Pre-Submission form to PMRA. The Committee is currently completing the final document (a Pre-Sub submission form) and hopes to have the NS PMUC submit the request with the PMRA shortly.

Apivar (amitraz).

The IPM Committee discussed several concerns regarding Apivar including access and resistance. On August 20, 2021, the Committee received news that bee vendors across Canada, except Bee Maid in Alberta, were sold out of Apivar creating a shortage of product in the Eastern Provinces. There were concerns that a shortage of one product would impact the availability of other mite treatments. Unfortunately, the IPM Committee could not respond in time to help. The matter was discussed by CAPA members via the listserv and members were assured that a shipment would be expedited from Edmonton to bee suppliers across Canada as of Sept 1. The role the IPM Committee could play in scenarios like this remains open for discussion.

Resistance to Apivar is increasingly a concern for Canadian beekeepers. According the 2021 CAPA Winter Loss Survey Report, Apivar is arguably the most used mite control product in Canada. Several reports regarding lower than usual efficacy were received in Western Provinces. A report of non-efficacy was submitted to Health Canada in May of 2021 by an Alberta beekeeper (available here). It is difficult to identify the cause of reduced efficacies as mite loads are not always quantified prior to treatment, effects can be variable between hives (and even between experimental reps of the same hives), and because label application methods are not perfectly adhered to. The volume of reports, however, seems to indicate an overall lower than usual effectiveness of Apivar in 2021 and concerns that mites may be developing resistance seem valid. Resistance to other synthetic miticides: Apistan has already occurred in Canada and cross-resistance with Bayvarol has been a concern. The potential of losing Apivar and/or other synthetic miticides, with no alternative synthetic miticides on the horizon is worrisome.

Resistance Testing

In response to Apivar resistance concerns, and a request from Canadian Honey Council, a Resistance Subcommittee was formed to a) define resistance thresholds and b) standardize resistance protocols to better enable Apiarists to c) assess resistance in their provinces and d) suggest methods to apply (or discontinue) synthetic acaricides that are below the efficacy threshold, e) agree on the value in which a synthetic acaricide is considered ineffective. The subcommittee includes: Cassandra Docherty, Derek Micholson, Nicolas Tremblay, Nuria Morfin, Medhat Nasr, Rassol Bahreini, and Samantha Muirhead. The

subcommittee met in October to identify the best components of the current methodologies used by the provinces to test for acaricide resistance, identify the main challenges to test for acaricide resistance (e.g. weak bees in highly infested colonies, finding enough infested colonies in one yard, and time travel), propose which parts of the protocols could be followed by all the provinces, and what parts of the protocols are 'flexible', and make suggestions accordingly. Subcommittee work will continue in 2022.

Provincial Minor Use Priorities

Agriculture and Agri-food Canada's Pest Management Centre will host the 2022 National Minor Use Priority Setting Meeting in March of 2022. The objective is to identify and rank major pest, weed and disease issues of Minor Use crops in Canada. PMC will undertake a limited number of projects to fulfil data requirements, prepare and submit registration requests to Health Canada's Pest Management and Regulatory Agency for the expansion of available crop protection tools (e.g. pesticides). Minor Use crop representatives are asked to identify and rank Minor Use issues at the Provincial level in advance of the National Priority Setting Meeting. The IPM Committee discussed the process and requested Provincial Apiculturists to facilitate communication between their respective bee industries and Provincial Minor Use Coordinators to ensure Provincial beekeeping priorities are ranked and included in the National list. Early in 2022, another meeting will focus on determining whether a National Strategy is warranted in advance of the National Priority Setting Meeting.

Asian Giant Hornets

The surveillance of Asian Giant Hornets (*Vespa mandarinia*) in BC was done in 2021 and will continue in 2022. For More information, please refer to PA reports for British Columbia.

Registered Pest Control Products for use in Apiculture

Product	Active Ingredient	Formulation	Registrant	Registration Expires
Mites				
Api Life Var	Thymol, Eucalyptus, Menthol, Camphor	Impregnated tablet	Chemicals Laif Spa	2025-12-31
Apistan	Fluvalinate-tau	Strip	Wellmark International	2025-12-31
Apivar	Amitraz	Strip	Veto-Pharma	2022-12-31
Bayvarol	Flumethrin	Strip	Bayer Inc.	2021-12-31
Checkmite	Coumaphos	Strip	Bayer Inc.	2023-11-01 (not manufactured anymore)
Formic acid	Formic acid (65%)	Liquid (for tracheal mite)	NOD Apiary Products Ltd.	2024-12-31
Formic acid	Formic acid (65%)	Liquid	Medivet Pharmaceuticals Ltd.	2021-12-31
Formic Acid	Formic acid (65%)	Liquid for Mitegone ready to fill kits	MiteGone Enterprises int. (Vaclav)	2024-12-31

Formic Pro	Formic acid (42.25%)	Gel Strip	NOD Apiary Products Ltd.	2025-12-31
Hopguard II	Hop Beta acids	Strip	Betatec Hop Products Inc.	2024-12-31
Mite Away Quick Strips	Formic acid (46.7%)	Gel strip	NOD Apiary Products Ltd.	2023-12-31
Oxalic acid	Oxalic acid dihyrdate; Ethanedioic acid	solid	Canadian Honey Council	2025-12-31
Thymovar	Thymol	Impregnated Wafer	Sylvar Technologies Inc.	2025-12-31
Small Hive Beetle				
Perm-Up	Permethrin	EC	United Phosphorous Inc	2024-12-31
Checkmite	Coumaphos	Strip	Bayer Inc.	2020-12-31 (not manufactured anymore)
Foulbrood				
Tylan	Tylosin tartrate	Powder	Elanco Canada Ltd.	
Oxysol-62.5	Oxytetracycline	Powder	Vetoquinol N A Inc.	
Lincomix	Lincomycin hydrochloride	Powder	Zoetis Canada Inc.	
Nosema				
Fumagilin-B	Fumagillin Dicyclohexylamine	Powder	Vita Bee Health Canada Ltd.	

Discussion: The members discussed the lack of definition of 'resistance' to synthetic acaricides, and the concern of the industry of a possible increase in reports of low efficacy of synthetic acaricides against Varroa. The members also discussed the status of the registration of formic acid.

MOTION: **Motion to accept the IPM Report as presented.**
MOVED BY: **Medhat Nasr**
SECONDED BY: **Paul Kozak**
CARRIED

Awards Report
Rob Currie

CAPA Awards Committee Report 2021

The committee was authorized to provide one award at the M.Sc. level and one at the Ph.D. level. It was a difficult choice with a slate of excellent candidates from across Canada.

The winner of the CAPA Student merit award at the M.Sc. level was Mireille Lévesque from Laval. The winner of the CAPA Student merit award at the Ph.D. level was Alvaro de la Mora from Guelph. Congratulations to both of the awardees on behalf of CAPA. For information, the previously announced winner of the Atwal-Siddo Scholarship was Abigail Chapman, as decided by the Research committee.
A call for applications for this year's competition has been advertised on CAPA-L and applications are due January 5, 2022. In order to facilitate coordination of the awards committee a Microsoft Teams site was created to house committee documents (certificate blanks, etc) and a separate e-mail was established to receive applications and communication related to the awards committee. Future applicants should submit their applications to the Chair of the committee at CAPAAwards@gmail.com.

The committee also decided to continue with the queen model as the award for the CAPA Outstanding Service Award. The artist has provided a preliminary estimate about 1 year ago for approximately $300 each. We have requested an estimate for an additional 5 awards to be cast which should come close to the cost estimated in the budget allocated in the last AGM.

The committee also wrote a terms of reference guide for the committee to help clarify the various tasks that need to be done throughout the year.

The committee is seeking a new chair for the 2022 year as I will be stepping down. I am happy to work with the new chair to ensure a smooth transition.
Sincerely,

Rob Currie,
CAPA Awards Chair

MOTION:	**Motion to accept the Awards Report as presented.**
MOVED BY:	**Paul Kozak**
SECONDED BY:	**Olav Rueppell**
CARRIED	

CBRF Report
Marta Guarna

CAPA Canadian Bee Research Fund Report 2021

2021 Membership:

CAPA representatives: Marta Guarna and Rhéal Lafrenière
CHC representatives: Albert Devries and Maggie Lamothe Boudreau.
CHC financials: Rod Scarlett

During the evaluation of research proposals and scholarship applications, Gard Otis joined the review panel since Marta Guarna removed herself from discussions because of conflict of interest due to direct association with applications and applicants.

CBRF proposals:

Four of the five applications were received in 2020. proposals were selected for funding and awarded $7,000 to each:

- Protecting queens against viral infections - McAfee et al
- Requeening with queen cells in canola pollination - Hoover
- Identification of genetic determinants of antimicrobial resistance and virulence in Canadian isolates of *Melissococcus plutonius* - Wood et al
- Towards increasing profitability of blueberry pollinating colonies - Bixby et al

Atwal scholarship:

Three applications were received and Abigail Chapman was awarded the Atwal Scholarship for 2021.

MOTION: **Motion to accept the CBRF Report as presented.**
MOVED BY: **Leonard Foster**
SECONDED BY: **Rob Currie**
CARRIED

Non-Apis Report

Graham Parsons

CAPA Non-Apis Committee Report 2021

Members of the committee: Graham Parsons (Chair); Rob Currie; Cassandra Docherty; Heather Higo; Paul Kozak; Alison McAfee; Lora Morandin; Nicolas Tremblay; Paul van Westendorp; Patricia Wolf Veiga;

The committee has been relatively quiet again this year as an organized committee with more work potentially in the "off season" for our members. As a group most of us met on Friday Feb 26th 2021 to introduce ourselves, set some plans for the year and review some of the groups perceived issues to tackle. The main areas of discussion or action for the upcoming year were discussed. The main ideas were exploring movement and regulation of non-apis pollinators with CFIA, pathogen spill over/spill back, pollinator habitat creation/pesticide recommendations and potentially updating the CAPA Pollinator BMP document.
Alison McAfee and Graham Parsons meet digitally with Bruno Gallant and Wendy Ashil of Canadian Food Inspection Agency to discuss movement of non-apis bees and some of the protections around them. In summary, from our discussion with Bruno and Wendy, we learned that the volume of movement of non-Apis bee species into Canada appears not to be known. While there are records of the number of import permits that have been issued, usually there is no limit to the number of individual shipments that can occur while the permit is valid (3 years). With the exception of *Bombus impatiens*, the movement of non-*Apis* bees is not generally regulated. While bees are considered "potentially injurious organisms" and could *in theory* be regulated by the framework in D-12-03, in practice this has not been done because surveys have not been conducted to determine where these species should be officially recognized as present. In the case of *B. impatiens,* there was a clear delineation of moving from a region where it was recognized (Ontario) to where it was not recognized (BC). Generally, only movement of "quarantine pests" is federally regulated within Canada, although provincial rules may differ. At the federal level, there does not appear to be information on the movement of non-*Apis* bees within Canada, but the provinces may have more information. A complete

summary of that meeting can be found in Appendix 1 and CAPA members are encouraged to read the summary.

Graham Parsons and Paul Kozak have joined the Apiary Inspectors of America Pollinator Committee which is a rough equivalent to the CAPA non-Apis committee, with more emphasis on unmanaged pollinators than the slight emphasis on managed pollinators of CAPA. This is a new committee within AIA and just finding their feet and goals for the group. A couple meetings were used to introduce each other and gather some consensus on the direction for the group. Currently the working goals of the group are:
Goal 1: Increase collaboration on pollinator habitat efforts within and among states.
In 2021, we will survey the AIA membership on projects in their states to learn about key collaborators, funding sources etc.
Goal 2: Guide the public in how to support pollinators.
In collaboration with the AIA Educational Outreach Committee, we will create documents such as "Should You Be a Beekeeper?", "How to Support Pollinators," etc.
We will also update the AIA website to include links to states' MP3's (Managed Pollinator Protection Plans) and sites such as Driftwatch.
Goal 3: Promote policies favouring pollinators at the state level.

In 2021, we will survey the AIA membership on legislation on pollinators in their states. We will ask about policy on pollinator habitat, *non-Apis* bees, etc.
An Ontario company Bee Vectoring Technologies received approval from the EPA for use in California of bees as a vectoring agent for a fungus *Clonostachys rosea* as a biological control agent for use in orchards and could potentially be used on strawberries, blueberries, almonds, sunflowers and other crops.
Saskatchewan Environment and Saskatchewan Agriculture have added a new measure to their State of the Environment report which includes a pollinator accessible landscape within agricultural land (https://www.saskatchewan.ca/residents/environment-public-health-and-safety/state-of-the-environment/saskatchewans-state-of-the-environment/agricultural-land-cover) . This metric measures "the proportion of cropland within 200 meters of natural land covers in landscape areas dominated by agriculture" with the goal of increasing the area within each ecodistrict to 90% of the landscape. Definitive examples on how this will be achieved aren't determined yet, but this provides some ability to measure it and at least monitor it going forward, with measures for amelioration planned in the future.
Bombus huntii continue to be available from BioBest for open pollination activities, but remain a special order item. Purchases require much advance notice to BioBest, can still be had. Saskatchewan Agriculture staff used 6 colonies this summer for a small demonstration project on pickling cucumbers comparing honey and leafcutter bees.

The National Bee Diagnostic Centre (NBDC) in Beaverlodge recently hired a research scientist specialized in pollination, Dr. Gail MacInnis. Gail is a broadly trained pollination ecologist, who specializes in wild bee pollinators of agricultural crops. Her research has spanned a diversity of cropping systems, from grain and berry crops in Eastern Canada, to cashews and nightshades in the Brazilian Amazon. She has a B.Sc. in Astrophysics, an M.Sc. in Environmental Science, and a Ph.D. in Entomology. Her current research focuses on quantifying the efficiency of wild bees as crop pollinators, and on improving the quality of agricultural

landscapes for both wild and managed pollinators. She is looking forward to continuing her research with Northern Alberta's wild bees, honey bees, and beekeeping communities.
Broadly speaking, interest in bees other than *Apis mellifera* seems to be growing. British Columbia, Alberta and Ontario have native bee societies open to the public with the general areas of focus being education about non-honey bees, habitat creation and protection of habitat and extension of information around non-honey bees and bee sightings. In the case of some (Pollination Guelph) there are regular meetings, AGMs with invited speakers. There are also examples of where native pollinator organizations (Bee City Canada and Pollination Guelph) are working with municipalities and apiculture (beekeepers and beekeeper associations). In Manitoba there is an organization promoting conservation of native bees and habitat for bees in general (http://www.beebettermb.ca/) as well as in Brandon https://www.facebook.com/beecitybrandon/ and there is a group of researchers, extension and conservation specialists that meets regularly to discuss pollinator issues called the "Manitoba Pollinator Group".

Discussion: The members discussed the possibility of keeping records of sales of non-Apis bees, and the use of non-native species for pollination services and the lack of regulations for their use.

MOTION: **Motion to accept the Non-Apis Report as submitted**
MOVED BY: **Paul Kozak**
SECONDED BY: **Olivia de Herdt**

Research Report
Marta Guarna

CAPA Research Committee Report 2021

1. Research Priority Setting

The research committee compiled a list of 10 research topics consolidating information from the CHC, and previous research priority exercises. The next step is to work with CHC to finalize a ranked research priority list.

2. Current Research Projects

Attached is a list of current research projects as reported by CAPA members.
The Chairperson of the research committee would like to acknowledge all researchers who contributed to this list and have been serving the beekeeping industry across Canada.

Last year, the executive was asked to provide this information to the Canadian Honey Council (CHC) for sharing it with its members. After checking that no contributor was opposed, the document was provided.

MOTION: **Motion to accept the Research Report as submitted.**
MOVED BY: **Medhat Nasr**
SECONDED BY: **Olav Rueppell**
CARRIED
Full Research Committee Report in Appendix 4

Communication Report
Kelsey Ducsharm

CAPA Communication Committee Report 2021

Committee Chair: Kelsey Ducsharm

Committee Members: Melanie Kempers, Rob Currie, Cameron Menzies, Rhéal Lafrenière, Nicolas Tremblay, Pierre Giovenazzo, Paul Kozak

No Stats for 2021:

Analytics did not run for 2021 so no user/traffic data is available.

2021 Happenings:

The communications committee made plans to change the membership section of the website. Instead of having a single profile for all members, we wanted members to have individual profiles on the CAPA website. This will increase site security as well as add convenience for members to track and pay for membership. Our current web host Kleurvision was hired to install and configure MemberPress on the website which will allow these changes to be made. This project is currently in progress. It should be noted that MemberPress comes with a subscription fee of $350 per year. The value of MemberPress should be evaluated to determine if this subscription should continue.

Plans for 2022:
- Have all members create an individual profile
- Evaluate the new membership features
- Add manual sales to the website
- Take suggestions from membership for improvement.

MOTION: **Motion to accept the Communication Report as submitted.**
MOVED BY: **Paul van Westendorp**
SECONDED BY: **Martine Bernier**
CARRIED

Africanized Bee Report
Amro Zayed

CAPA Africanized Honey Bees Committee Report 2021

Africanized bees and their range in the US
Africanized honey bees (AHB) are a highly aggressive and invasive hybrid strain of honey bees that is derived from the African honey bee subspecies *Apis mellifera scutellata* with minor genetic contributions from West and East European honey bee races that were present in South and North America prior to the invasion of AHBs in 1956. The USDA (http://www.ars.usda.gov/research/docs.htm?docid=11059&page=6) has confirmed the existence of AHBs in the following states: California, Nevada, Arizona, Utah, New Mexico, Texas, Oklahoma, Louisiana, Arkansas, Florida, and Georgia. Some AHB colonies were reported from Alabama and

Tennessee, but it is not clear if AHBs have established in these areas. AHBs where recently confirmed in the East Bay area (near San Francisco), suggesting that AHBs are slowly expanding their northern distribution in that state (Kono and Kohn, 2015).

In 2017, researchers did confirm the expansion of AHBs in California (Lin et al., 2018); Lin et al collected 2699 bees from California and tested for AHB genetics using a maternal mitochondrial DNA marker. Lin et al. confirmed that the northern counties of Napa and Sacramento now appear to be the northernmost range of AHBs in California. A few counties north of Sacramento where sampled (e.g. Butte and Shasta) but AHBs were not found. It is important to note however that Lin et al. did not sample many counties north of Sacramento and Napa, and when they did, they often sampled a small number of workers (e.g. only 6 bees were collected from Yolo county). Another important caveat to consider is the standard mtDNA test employed by the researchers is not an ideal test (see ***detecting methods***).

A recent study published in 2020 found no evidence of AHB genetics among 5 fully sequenced honey bees from Davis, California (USA) (Calfee et al., 2020). However, we note that these Davis samples were actually collected in 2014 (Calfee et al., Supplementary Table S1). As such, these results should be taken with a grain of salt; it may be possible that AHBs have expanded north into the Davis area since 2014.

Risks to Apiculture in Canada

The Canadian Food Inspection Agency (CFIA) published a *"Risk Assessment on the Importation of Honey Bee (Apis mellifera) Packages from the United States of America (V13), September 2013."* The CFIA noted that

"*…AHB presents a threat to the public and animal health, as well as to Canadian beekeeping industry, because of the significant impact on productivities and potential trade issue with live honey bee material*"

The CFIA estimated AHBs Entry Risk Probability as "Moderate to High", Exposure Risk Probability as "Small", Consequence Risk Estimate as "Moderate", and overall Risk Estimate as "Low to Moderate".

Annual movement of hives in the US, including from states that are known to have AHB to states that currently do not have AHB continues to be an area of concern for introducing AHBs in Canada. Swarm dispersal across the border is always a possibility, even though there have been no cases of AHB spreading into Canada through that route. Another potential risk factor is the threat of AHBs invading into regions that currently supply most of Canada's imported queens and bee packages, such as Hawaii, northern California, Chile, New Zealand and Australia. It is therefore important that the surveillance and testing used to monitor the occurrence of AHB around the world continues to be a high priority.

Detecting AHBs: mtDNA and morphometrics

There are two methods that are currently used to detect AHBs: Morphometric measurements and mitochondrial (mt) DNA testing. Both methods suffer from some setbacks. First, it is not clear if morphometric measurements are effective at detecting hybrid colonies. Second, mtDNA analysis fail to detect colonies with European queens mated with one or more Africanized drones because mtDNA is maternally inherited – all workers and drones from this colony will carry the European queen's mitotype. The CFIA's latest risk assessment noted this:

"*Certifying populations free of AHB is an issue. The mitochondrial DNA and the morphometric analysis used to identify Africanization in samples of bees are not 100% reliable; mitochondrial DNA is maternally inherited, and hybrids might not be detected through morphometric analysis because of the different degrees of hybridization (Guzman-Novoa, 2012).*" [citation to Dr. Ernesto Guzman's CAPA AHB report, 2012, also see Guzman-Novoa et al. (1994) and Nielsen et al. (1999)]

and

"No further developments in identification methods have occurred; testing will not accurately detect the presence of Africanized stock in bee populations or packages."

Detecting AHBs: SNPs

In 2015, a new test for detecting AHBs was developed by Dr. Ben Oldroyd (University of Sydney Australia) and Dr. Amro Zayed (York University) that uses 96 single nucleotide polymorphisms (SNPs). SNP markers reside in the nuclear genome, are bi-parentally inherited, and should allow for estimating a continuous degree of Africanization (i.e. 0 to 100% African, versus mtDNA which provides a binary answer such as African or not African). The test, along with the sequences for the SNP markers and the procedure for testing bees, was published in two peer-reviewed journals (Harpur et al., 2015, Chapman et al., 2015). In Canada, a 25% African ancestry was empirically determined to be the threshold for classifying bees as AHBs (>25% African ancestry) or non AHB (<25% African ancestry).

The test has been shown to accurately (>>95%) detect AHBs vs. typical European managed bees in the US, Australia (Chapman et al, 2015), and Canada (Harpur et al, 2015). The CAPA AHB Report October 2021 Australian Government is currently assessing the use of this SNP test for screening imported honey bee semen (Dept. of Agriculture and Water Resources, Australian Government. Importation of Honey Bee Semen: Draft policy review. 2015; http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/riskanalysis/current-animal/draft-policy-review-importation-honey-bee-semen.pdf) Currently, the cost of genotyping a single bee at 96 SNPs is substantial ($15 to $20). While suitable for testing semen, certifying colonies as AHB-free would require genotyping many individuals. A honey bee queen mates with 15 to 25 different males. Considering, a European queen mated with 1 out of 20, 2 out of 20, or 5 out of 20 African drones; the probabilities of detecting this level of Africanization if a SINGLE worker was tested are: 5%, 10% or 25% - too low to be acceptable (Zayed, analyses based on the binomial distribution. unpublished). Genotyping 50 workers would substantially improve the odds of detection to: 92.3%, 99.4%, and 99.9% respectively. However the cost of testing this many bees will be $750 to $1000 per colony. A recent study showed that 37 SNPs (out of the original 96 SNPs) can be used to study the ancestry of unknown honey bees, which reduces the cost of the SNP assay by one half to one third (Chapman et al., 2017). There has been recent progress in refining SNP-based tests and developing cheaper PCR-based tests that target insertion/deletion mutations in bee genome, which are expected to be published in 2022 (Zayed, personal communication).
It is important to lay the groundwork for recognizing SNP-based tests for AHBs as a potential CFIA's importation requirements. It is also important to CFIA to work with our queen suppliers to be prepared to meet this new requirement without disruption of queen imports. SNPs are becoming the 'gold-standard' for genotyping, and the current SNP test is significantly more accurate relative to its more historical counterparts.

AHBs in Canada

In 2016, the Canadian National Honey Bee Health Survey (https://www.gprc.ab.ca/doc.php?d=2016NHBHS), carried out by the National Bee Diagnostic Centre, tested bees from 314 apiaries (British Columbia, Alberta, Manitoba, Ontario, Quebéc and the Yukon Territory) for African ancestry using a mtDNA assay (see ***detecting methods***, above); the mtDNA tests were *positive* for Africanization in 26 apiaries (8.2%) and across all sampled provinces and territories. These samples where then independently analysed with a nuclear SNP test (see ***detecting methods***, above); all samples tested *negative* for Africanization (i.e. had African ancestries below the 25% threshold; they ranged between 0.6 to 15.9%). Two possibilities can explain these conflicting results:
1) The mtDNA AHB test is reflecting African but not *A. mellifera scutellata* ancestry in our Canadian bees. Previous researchers have found African ancestry in managed honey bees from Canada, Australia, and

Central/Northern US that may reflect importation of North African and Middle Eastern honey bees in the early 1900's (Harpur et al., 2015).
2) A number of AHB queens were accidently introduced into Canada; daughters of these queens hybridized with European colonies. This process, combined with selection against CAPA AHB Report October 2021 aggressive colonies, can over time lead to honey bees that have a mostly European nuclear DNA but an African maternal DNA. Additional work is needed to better understand and put into context the results of the Canadian National Honey Bee Health Survey. Particular, additional tools that specifically track *A. m. scutellata* ancestry, and not generic African ancestry, would be very useful for interpreting the results from mtDNA and SNP testing.

Mitigation plans
It is important to continue to treat the risk of importing AHBs seriously. It is recommended that CAPA, CFIA, and provincial authorities collaborate to ensure that plans are in place to mitigate the risk of accidentally importing the highly invasive and aggressive AHBs into Canada; these plans should use the best tools for detecting AHBs. Provincial Apiary Programs should also develop protocols and strategies for responding to suspected or confirmed cases of AHB. Moreover, it is important to work with major exporting countries to ensure that the international queen bee supply chain is not contaminated with AHB genetics. It is important to note that the annual movement of hives in the US, including from states that are known to have AHB to states that currently do not have AHB, substantially increases the risk of introducing AHBs in Canada. Additionally, consideration should be given for developing a National AHB surveillance system and pest response plan within Canada. It is also important for the beekeeping industry and regulatory body across Canada to consider alternatives for queen sources if African bees have become a problem in regions that supply queens to Canada.

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MOTION: **To accept the Africanized Bee Report as submitted**
MOVED BY: **Paul Kozak**
SECONDED BY: **Marta Guarna**

CARRIED

Archives Report
Rob Currie

CAPA Archive Committee Report 2021

There were no significant requests for the archive committee to deal with to this point in 2021. The CAPA proceedings are maintained in the members area on the CAPA website. Simon Fraser University archives currently houses some CAPA material that is primarily under Dr. Winston's section and contains the archival material associated with the Apimondia meeting that was held in Vancouver. There is also a set of the proceedings there.

Rob Currie

MOTION: Motion to accept the Archives Report as presented
MOVED BY: Paul Kozak
SECONDED BY: Olav Rueppell
CARRIED

Tech Transfer Team Report
Nicolas Tremblay

CAPA Technology Transfer Teams Committee Report 2021

CAPA Technology Transfer Committee Teams 2021 report
The following report is a compilation of provincial reports from each Canadian beekeeping technology transfer program.

British Columbia Technology Transfer Program
TTP lead: Nuria Morfin

New program
The BC Honey Producers Association would like to welcome Dr. Nuria Morfin as the Program Lead for our newly formed Tech Transfer Program.
Nuria comes to us with 14 years of experience in beekeeping, research and extension, linking both research and industry. She completed her Ph.D. at the University of Guelph with Dr. Ernesto Guzman and has expertise in diverse areas including Integrated Pest Management, selective breeding, and honey bee pathology. Since completing her Ph.D. she has worked as a researcher studying the impact of stressors on health and behaviour, analysing the mechanisms behind behavioural immunity, and studying the lipidome and metabolome profile of bees.
Nuria has also worked as a Bee Inspector for the Ontario Ministry of Agriculture, Food, and Rural Affairs. Throughout her career she has been actively contributing to apicultural research and industry, acting as a link between them.

With Nuria's experience and commitment, we are confident that her leadership will provide a strong foundation for BC's new Tech Transfer Program!

Alberta Tech Transfer Program
TTP lead: Renata Borba

Projects

1. Colony Health Monitoring Program (CHMP): This program was designed to assist beekeepers with colony health inspections in their operations, and to provide feedback on the visual inspections and lab diagnostics results. In 2021, a total of 85 apiaries (27 beekeepers) were sampled 2-3 times during the year: spring, summer and fall (2360 samples). Each participating beekeeper receives a field inspection and lab disease diagnostics report. At the end of the season, a yearly report is produced compiling the data from all beekeepers for an overall evaluation of the colony health status in Alberta. Participating beekeepers are also encouraged to contact the TTP lead anytime with questions.

2. Integrated Pest Management Training: This *on-farm* training covers Integrated Pest Management (IPM) principles, basic honey bee biology, pathogens (AFB, EFB, Chalkbrood, Nosema, Viruses), parasites (Varroa mite), pests (small hive beetle, wax moth), IPM strategies and plan. The IPM training is divided into two parts: lecture (indoors) and field training (outdoors). A total of 4 beekeeping operations registered for IPM training. COVID-19 protocols were established to assure the health and safety of workers and TTP staff.

3. Miticide Resistance Project: The Government of Alberta's Bee Health Assurance Team (BHAT) and Alberta's Tech Transfer Program (TTP) are proactively working to assess potential miticide resistance in Alberta. Our goal was to randomly screen Varroa mite populations in the province before fall treatments. Beekeepers were encouraged to collect and mail Varroa-infested live bees from highly infested colonies to our lab for testing. The program was limited to a maximum of 30 beekeepers (owning 50+ colonies), 3-4 colonies per apiary and a maximum of 2 apiaries per beekeeper.

4. Research and Educational Projects:

a. "Mass storage of summer-mated queens during the winter in Alberta": This is a project in collaboration with Dr. Shelley Hoover. The objectives of this project are to: 1) Provide proof of concept that overwintering queens en masse is feasible in Alberta, 2) Develop prototype management strategies for mass overwintering queens in Alberta, 3) Validate the performance and quality of overwintered summer-mated queens, 4) Calculate the economic viability of a successful winter storage system of queens en masse, and 5) Disseminate the knowledge via workshops, conferences and publications.

b. "Protecting the biosecurity of Alberta's beekeeping industry through the development of a comprehensive beekeeping education program": This collaborative project between ABC and Alberta Farm Animal Care (AFAC) will support the development and delivery of a comprehensive Alberta beekeeping educational training program and the creation of supporting educational materials. The training program and educational resources will increase the awareness and adoption of appropriate biosecurity practices as recommended by industry organizations and supported by research. Additionally, these resources will be accessible/usable by all; hobbiests, commercial beekeepers and seasonal workers. Training materials will be produced in two languages (English and Spanish).

c. "Queen Rearing Course": A post-secondary certified queen rearing/breeding course will be developed in collaboration with ABCbees (Apiaries and Bees for Communities) and offered to beekeepers through the Northern Alberta Institute of Technology (NAIT). This course will help new and existing beekeeping

operations access knowledge that would reduce import costs, improve sustainability of their hives, expand operations, and improve profitability.

Workshops/Presentations

Due to the COVD-19 health restrictions in place, both workshops organized were hosted virtually: Integrated Pest Management Workshop and Honey Bee Pests and Diseases Identification Course. We decided not to host the Southern Alberta Beekeepers Meeting and Breeders' Day this year.

1. **Hive-side chat Webinars:** The goal of the *Hive-side-chat* is to create an opportunity for beekeepers throughout the province to learn and discuss various topics related to honey bee health, biology, pathology and more. Webinars are held monthly during the *off* bee-season.
2. **TTP YouTube channel:** Presentations from selected TTP events as well as the hive-side chat webinars can be found here, @AlbertaTechTransferProgram.

Articles

1. **Factsheets and Extension Materials:** Numerous extension materials were developed throughout the year including: queen rearing calendar wheel, *Varroa* sampling and monitoring fact sheet, Varroa treatment 101, Nosema sampling fact sheet.

2. **TTP website:** Our website is a one stop location where beekeepers can find TTP-related information including beekeeper services, events, workshops, research projects, factsheets, and extension and educational materials. www.albertabeekeepers.ca/tech-transfer-program/

Involvement

CAPA, AB pollinators group, Alberta Farm Animal Care

Saskatchewan Beekeepers Development Commission: Bee Tech Adoption Program

Program Lead: Dr. Medhat Nasr

Projects run by SBDC-TAP

1. Project Title: Developing Alternative Miticides to Replace Amitraz to Control and Manage the Resistant Varroa Mites in Honey Bee Colonies. (2021-2023)

This project has been considered a high priority to the Canadian beekeeping industry by the Canadian Honey Council. It is essential at this time to come up with alternatives to Apivar® because this industry is under imminent threat and soon will no longer be able to control varroa mites. It is time to act now to maintain a healthy sustainable beekeeping industry and secure healthy bees for crop pollination.

The objectives of the proposed project are:

A. Determining the toxicity of potential miticides to varroa mites and the safety to honey bees under laboratory and Field conditions.

B. Advance vetted miticides to determine field dosages and application methods that are effective on mites and safe to bees.

2. **Project Title:** Demonstration of assessment methods of honey bee hygienic trait and unhealthy Brood odour Assay and their implications on bee varroa-resistance, and colony health and survival. (2021-2022)

The objectives of this project are:

A. To demonstrate and apply two methods for evaluating honey bee hygienic behaviour trait: traditional Freeze-Killed Brood (FKB) assay and the Unhealthy Brood Odour Assay for selection of hygienic honey bee stocks.

B. To demonstrate the value of adopting these science-based bioassays in the development of honey bee stocks for greater resistance to Varroa and improved bee health in Saskatchewan.
Results: collected information and samples are being analysed.

3. Project Title: Saskatchewan (SK) Honey Bee Health Plan: Optimization of Local Honey Bee Queen Production Practices for Greater productivity, Performance and Profitability. (2021-2022)
The objectives of this project are:
A. to identify queen production conditions used across Saskatchewan.
B. to assess the queen's quality as bioindicators to bee "good" or "failing".
C. to find the inter-relationship between production conditions and quality of queens.
D. to communicate developed information with queen producers.
Results: collected information and samples are being analysed.

4. Project Title: Epidemiological Approach to Address and Enhance Management Practices for European Foulbrood in Saskatchewan (2021-2022)
The objectives of this project are:
A. Establish risk factors associated with EFB by gathering information from beekeeping operations.
B. Sample infected colonies across Saskatchewan to determine the relatedness of lab diagnostics to clinical signs.
C. Evaluate current control and prevention measures to assess their effectiveness.
Results: collected information and samples are being analysed.

Manitoba Knowledge & Research Transfer Program (KRTP)
KRTP Lead: Derek Micholson

Projects
1. Bee Health Monitoring Program: This program aims to assist beekeepers with sampling & diagnostic services, as well as provide provincial monitoring of common pathogens and parasites in both the spring and late summer. Hygienic behaviour testing is also offered to registrants of the program.

2. Calibrating the dose of oxalic acid in commonly used vaporizers through the quantification of OA on bees.
Project Summary: The efficacy of oxalic acid vaporization treatments on varroa mites is dependent on but not limited to the seasonal timing of application, ambient temperature, adult bee population, amount of brood present, type of OAV applicator used, and the dosage of oxalic acid dihydrate. To help calibrate the dose of OA required to be used with different applicators, a laboratory technique is being worked out to quantify the amount of OA present on bees after a treatment with one of four commonly used vaporizers applied under two temperature conditions.
3. Apivar/Amitraz Resistance Testing: Testing was performed on colonies from two operations in Manitoba with high varroa levels in fall 2021; as well as on colonies from the University of Manitoba to compare an amitraz-susceptible varroa population. Two resistance testing methods were used to compare and attempt to calibrate the methods.

4. Detection of Honey Adulteration and Point-of-Origin (Peter Awram & Leonard Foster) – Facilitating the collection of Honey Samples in Manitoba

Workshops/Presentations

- University of Manitoba Beekeeping Course (Jan-April 2021) – Guest lecturer for 2 lectures, general technical assistance throughout the 8-week course (virtual this year due to Covid-19), and participation at the (virtual) field day meeting.

- Manitoba Beekeepers' Association convention (Feb 2021) and presentations to each of the 3 local Manitoba beekeeping associations (Feb-Mar 2021): "Introducing the KRTP"

- "Integrated Pest Management of Varroa" workshop (April 2021; with Rhéal Lafrenière and Dr. Rob Currie)

- Manitoba Veterinarian Training – Honey Bee Biology, Beekeeping Equipment and Management, and Field Identification & Biosecurity of American Foulbrood (Sept 2021; with Rhéal Lafrenière and Dr. Rob Currie)

Individual service

- General beekeeping advice/guidance via email & telephone

Articles

- Quarterly contributions to the 'Manitoba Beekeeper' newsletter

Involvement

- Attendance and participation at most local beekeeping association meetings

Other

The first year for the KRTP saw the program get off the ground. Much of the work this year revolved around logistics of getting the program running and a few larger activities such as collecting hive & equipment donations, establishing the KRTP research yards, and the development and implementation of the Bee Health Monitoring Program. Due to Covid-19, less emphasis was put on offering workshops this year as in-person workshops were not possible. However, some virtual workshops are being planned for the winter months. The KRTP is looking forward to its second bee season and hopefully hosting more in-person events next year.

Ontario Technology Transfer Program

TTP lead: Colette Mesher

Projects

1. **Project title:** Ontario Resistant Honey Bee Selections (ORHBS) Program

Project Summary:

The Ontario Resistant Honey Bee Selections (ORHBS) program is a long-term program with the objective to incorporate and maintain disease resistant characteristics in Ontario's honey bee stock.

Bee breeders in Ontario selected colonies with favourable characteristics to be tested for tracheal mite resistance and hygienic behaviour. In order to ensure tracheal mite resistance persists, all breeders are thoroughly monitored to ensure no colonies with tracheal mites exist in a breeding program; no positive tracheal mite colonies have been found in the ORHBS program since 2006.

Hygienic behaviour is important for brood disease resistance within a colony. The liquid nitrogen freeze kill method was used to test for hygienic behaviour. Colonies which ranked in Group 1 (>95% of killed brood removed) and Group 2 (75-95% of killed brood removed) were recommended for use as breeders for

the subsequent generation. Testing for hygienic behaviour was conducted on approximately 455 potential breeder colonies for 28 bee breeders in 2021.
Honey bee samples were collected from all potential breeder colonies. At the time of hygienic testing, forager bees were collected. Bees were also collected from the brood chamber before treatments were applied in the spring or fall. Varroa and tracheal mite infestation levels were determined, and *Nosema* spore levels analysed as an indication of the health of the colonies. Monitoring the health of breeder colonies helps ensure the quality of the bee stock produced in Ontario.
We are trialling collecting Low Varroa Growth (LVG) data on a limited number of breeder yards.

2. **Project Title:** Mid-season treatment methods to control Varroa mites during a honey flow

Project summary

Beekeepers implement Integrated Pest Management (IPM) strategies in order to control various pests and diseases, including Varroa mites. The use of in-hive acaricides is a main point of any IPM plan. A major gap in IPM strategies to combat Varroa is tested and approved in-hive treatments that can be applied during mid-season honey flows, which would allow beekeepers to keep Varroa mite levels below damaging thresholds and improve the health of honey bees that need to survive the winter months.
This project aimed to address this gap by implementing field trials for 3 different mid-season treatments that could be used during honey production. Along with controlling Varroa mites, these treatments should not contaminate honey suppers that are on colonies during the treatment application. The products to be tested are: oxalic acid drizzle method (Skinner et al., 2007), oxalic acid glycerine method (Maggi et al., 2016), and formic acid “flash” method (Skinner et al., 2007). These are known and tested treatment applications during spring and fall, but have not been tested or recommended for use during mid-season for efficacy and risk of honey contamination in Ontario.
The bulk of field trials for this project were completed in the 2018 and 2019 field seasons. Final colony weights, winter survival, and spring Varroa levels were all assessed in the spring of 2020. We received the honey residue analysis in 2021 and were able to compile this data for it to be included in a package presented to the government for the extension of the Oxalic acid label. Work is still being undertaken and we hope to have progress on this in the near future.

3. **Project Title:** BeeCSI: ‘omic tools for assessing bee health

Project summary

The BeeCSI project is a collaboration with Dr. Amro Zayed from York University and Dr. Leonard Foster from UBC, as well as a number of other researchers across the country. This project aims to use genomic tools to develop a new health assessment and diagnosis platform powered by stressor-specific markers. Working with beekeepers, industry technology-transfer teams, and diagnostic labs, in consultation with federal and provincial regulatory entities to ensure that the tools are implemented and accessible to the beekeeping industry by the end of the project.
TTP led the 2nd year of a pilot project aimed at examining the feasibility of beekeepers using BeeCSI diagnostic testing. The pilot project was only done in Ontario, and involved 20 beekeepers and a total of 50 colonies. These beekeepers and colonies were divided up among beekeepers who perform pollination services, commercial honey producers, and hobbyist or small-scale beekeepers. The colonies were sampled

and assessed three times throughout the season, similar to the corn experiment, and samples will also be analysed for stress markers. In addition, participating beekeepers filled out detailed questionnaires, and will take part in focus group interviews to discuss their thoughts on the value of the diagnostic testing to their operation and management practices. The BeeCSI study will involve repeating the pilot project sampling in 2022, in order to continue to involve and engage the beekeeping industry that will hopefully benefit from this type of diagnostic testing.

4. **Project Title:** Grassroots Growth Initiative (GGI)

Project summary

The Grassroots growth program is funded by OMAFRA with a strong emphasis on public engagement, focusing on youth and enhancing safety. Our project has 5 different sections. The first being field days with local beekeeping clubs which focuses on pests and disease mitigation. Support for the development of youth beekeeping clubs through educational material and training for experience and new course leaders. Train the trainer is the third section and we are currently developing the materials and how to best approach the need for certified trainers and mentors in the province. The last two sections focus career development with new online workshops targeting antimicrobial use, commercial beekeepers and management as well as analysing historic and recent data to find potential trends and gaps that need addressing in the industry.

<u>Field days</u>

Upper Ottawa Valley (Indoor) beeyard session Aug 7
Muskoka and Parry Sound Beeyard session Aug 21
Quinte Beeyard session Sept 11
COBA Beeyard session Sept 19
Ausable Virtual Oct 4
MOEBA Beeyard session Sept 25
MOEBA Virtual Oct 21

<u>Youth beekeeping</u>

Dryden/Kenora August 21st in Kenora
5 clubs have shown interest for intro virtual session 2nd week of November
Advanced beekeeping virtual session (Kawartha, Niagara and Dryden/Kenora) 2nd week of November.

Workshops

- Our normal hands-on workshops in 2021 were cancelled due to COVID-19 restrictions
- 24 online workshops were offered on the online platform Apiology 101:
- 12 Introduction to Beekeeping workshops
- 12 Integrated Pest Management workshops
- students were enrolled (363 in Intro, 161 in IPM, for a total of 524 as of October 15, 2021)

Articles

- Bi-monthly submissions to the Ontario Bee Journal
- “Ask an Expert”
- What do Varroa mites actually eat?
- What do I need to know about AFB?
- How do I requeen my colony?
- How do I use a bee escape?
- Should I leave my screened bottom board on over winter?

- How should I use oxalic acid as a Varroa control?
- “TTP Feature”
- TTP Update
- App review
- The biology of honey bee mating
- Failing colonies
- Honey crystallization
- How much work does it take honey bees to produce one teaspoon of honey?

Involvement

- TTP participated in the following meetings:
- PAACO, Feb 22
- ORHBS meeting, Mar 25
- 16 virtual and 2 in person meetings at Local Beekeeping Associations:
- Central Ontario Beekeepers Association Apr 24
- Muskoka Parry Sound Beekeepers Assc. Feb 24
- Urban Toronto Beekeepers Association Mar 2 and Apr 6
- Saugeen River Beekeepers Club Mar 9, Apr 13 and Oct 12
- Dufferin Beekeepers Association Mar 16 and Sept 21
- Ausable bee club Apr 12
- Kenora Beekeeper's Association Aug 25
- New member day (OBA) Apr 24
- Middlesex Beekeepers Association May 6
- Quinte Beekeepers Association May 11 and Oct 20
- Toronto District LBA June 7
- Saugeen Beekeepers Association Oct 12
- Lanark Beekeepers Association Oct 28
- OBA spring meeting, Mar 27 and Apr 3
- OBA Annual General meeting, November 2 and 9

Other

- Cottage Life Outdoor Living Show Mar 26-28
- Sunnybrook HSC earth week event Apr 19
- Sarnia Lambton Native Friendship Centre Apr 22
- Girl Guides May 4
- Uxbridge Earth Kids May 15
- Toronto Brownies group May 4
- Colborne Seniors Centre (Oakville) Oct 14
- Peel School Board Grade 1/2 June 11
- SMCDSB kindergarten June 7

Many outreach initiatives are still on hold in 2021 because of COVID-19 restrictions. Hands-on workshops were cancelled for the most part. We were fortunate to be able to adjust office protocols and carry out research projects as scheduled. Hiring of two summer students occurred this summer as usual. The team was divided up into two “vehicle” groups. These groups would travel to research yards and bee breeder operations only with their group members, in order to prevent cross-contamination if one group were to contract COVID-19. This was set up to allow for the field work and research to continue by the other group, if one were to get sick. In addition, all employees checked their temperature each morning before starting

work, and masks were worn in the office when distancing wasn't possible. All team members took turns disinfecting high-touch surfaces in the office and lab at the end of each day. These protocols are always evolving with the adoption of vaccinations and changing protocols and restrictions. We hope to return to in person workshops and OBA meetings in 2022.

Identification of the tech transfer team: CRSAD Services-conseils
TTP Lead: Martine Bernier agr.

In the last year Martine Bernier have taken the lead of the new Quebec Tech Transfer Team. Nicolas will still visit producers and give them recommendations. But Martine will be the lead of the tech transfer team and responsible of developing formations and tools in link with the research and the field in collaboration with Nicolas. What we are calling the first and the second line.
Here rapidly her principal's realisations in the last year:
-The PCR prevention and control project which included the full workshop, a summary document and a summary video.
-The guide to good pollination practices, still in drafting.
-Continuing the dissemination of the beekeeping genetics of CRSAD resulting from the bee genetic selection program.
-Basic beekeeping training.
Future
-Several trainings, webinars and guides are in preparation.

Projects
-Stimulate the use of the application "ApiProtection» to locate apiaries in Chaudière-Appalaches and Capitale-Nationale.
Currently, one of the problems for the protection of honey bees is to know the location of the apiaries in order to adapt the phytosanitary treatments made in the crops nearby and to notify beekeepers
In order to protect pollinators, various projects, funded by MAPAQ, have been carried out by CRSAD in the Chaudière-Appalaches region and in the Capitale-Nationale region. A first project in 2013-2014 consisted of identifying the apiaries and developing an informative map available on InfoSols. A second project consisting in the development of an application for locating apiaries called ApiProtection was carried out in 2017-2018. Since 2018, CRSAD has been carrying out a third project: Stimulating the use of the "ApiProtection" utility to locate apiaries in Chaudière-Appalaches and Capitale-Nationale. CRSAD contacted all beekeeping companies in the two regions, met some beekeepers and supported several to register apiaries on the ApiProtection site: https://apiprotection.crsad.qc.ca.
By working with agronomists, farm businesses can find out if there are apiaries near their pesticide application sites and adapt their management and treatment practices to protect the health of pollinators. Agronomists in these regions have been invited to register and use the utility for these purposes.
-CRSAD CEDFOB partnership on the North Shore of Quebec.
Since 2015, a research partnership has been in place with the Baie Comeau Boreal Forest Experimentation and Development Center (CEDFOB). CRSAD provided honey bee and queen bee colonies and technical guidance to maintain healthy colonies throughout the following projects:
Improve northern beekeeping techniques for pollination of berries from the boreal forest (2015-2017).

Development of the production of lingonberry Ida on the North Shore by bee pollination services (Apis mellifera) (2018-2020).
The experimental apiaries were placed with agricultural producers with little or no experience in beekeeping. Throughout the projects, agricultural producers, the CEDFOB student field team and researchers were trained and supervised by the beekeeping advisory services of CRSAD.
Over the years, a total of seven agricultural businesses on the North Shore, from Baie-Comeau to Blanc-Sablon, near Labrador, have been introduced to beekeeping.
The work of the first project made it possible to develop new techniques for insulation and ventilation of beehives during the rainy season and to support the colonies during periods when foraging is not possible. These techniques are now used by several commercial beekeepers across the province.
The following guide from the first project is available to everyone.https://www.agrireseau.net/apiculture/documents/100114/guide-de-conduite-d_un-rucher-nordique-quebecois

Workshops/Presentations
-MAPAQ information days (3) on pollination: What to do to allow colonies to develop quickly for maximising honey production.
-Since 2015, Nicolas is a teacher for Alma College's online training in beekeeping business operations. He teach beehive management, the harvesting and marketing of beekeeping products and the development of honey house.
Individual service
-33 beekeepers received advisory services in 2021.
The number of visits varies from 1 to 5 during the season.
The main topics covered with beekeepers are as follows: start-up assistance for new beekeepers, setting up optimal hive management, monitoring and management of varroas, management of American foulbrood and Nosema without antibiotics, good rotation of combs, the set-up to become an organic beekeeper and layout of honey houses.
-5 Wild Blueberry Growers: Inspection of the strength of hives strength during pollination to determine the price to pay the beekeeper.
-1 cranberry grower: Inspection of the strength of hives during pollination to determine the price to pay the beekeeper.

Early spring temperatures responsible for high varroa development. The standard strategy was not enough this year. Producers should have treated one month earlier. Treatments are not effective if use too late and the colony is already unstructured.
We get ground cold at the beginning of blueberries pollination. A lot of hives has been taking off because of the lack of flowers and the beekeepers concerns.

Articles
AADQ's bee review (1 article per season)
-The use of protein supplement
-Spring stimulation
-Summer varroa alert
-2021 varroa report and new Nutritional facts table

Involvement
-Vice-president of the beekeeping committee of the Quebec agriculture and agrifood reference center (CRAAQ). Development of a guide on pollination of wild blueberries and cranberries.
-Member of the AADQ Organic committee.

Atlantic Tech Transfer Team for Apiculture
Andrew Byers: Team lead and Senior Apiculturist
Monica Winkel: Full-time Apiculturist
Annie Bennett: 2021 Seasonal Apiculturist

ATTTA is working on 5 key objectives related directly to building the pollination capacity of honey bees for lowbush blueberries:

1. Improve honey bee health and nutrition
2. Improve disease and pest monitoring and treatment (including IPM strategies)
3. Improve overwintering success
4. Improve biosecurity techniques
5. Optimize pollination in lowbush blueberry

Projects
Field work 2021
Project One - Optimal hive strength for Pollination of Wild Blueberries
Site numbers
Nova Scotia 5 fields (4 assessing hive strength and stocking rates, 1 honey bees plus bumble bee quads)
New Brunswick 4 fields (assessing hive strength and stocking rates)
In order to relate hive strength (and stocking rates) with wild blueberry production, eight fields across the Maritime region (NB & NS) were be used. These fields had an initial assessment of the strength of the honey bee colonies used for pollination, stocking rates also determined. As well as quantitative measures of hive strength, the hives have been categorised against an established pollination standard. All hives studied were in the same configuration of 2 deeps to maintain consistency and allow for easier manipulation of frames.

Hive assessments at all sites
A sample of hives were be assessed for strength within 24 hours of being placed on the fields. An average hive strength for each field will be determined. Hive strength was determined by an internal hive inspection which counted the number of frames of bees, the number of frames containing brood with and estimate of overall % coverage, the number of foraging bees per minute and for any disease symptoms.

Plant Assessment at all sites
The percent bloom was determined at the time of hive placement. Measuring the pollination success will be achieved through assessment of sampling five locations per trial field. The locations will be geotagged and marked with a flag to identify locations. There will be assessments of the bloom and fruit at three time points.

Project Two
Site numbers 3 – Honey bee foraging during wild blueberry pollination
In order to determine nutritive state of honey bees during pollination, pollen traps were placed on 3 – 4 hives in three locations. The locations are large blueberry fields (> 100 acres) and the pollen collection traps were

placed on the hive for a 24-hour period. Post pollination, the collected pollen will be analysed for plant species in order to determine the floral sources of pollen available to honey bees on large wild blueberry fields during pollination. This work will complement the research undertaken in 2020 on smaller fields to determine the difference in honey bee diets between relatively large and small fields.

Pollination Education Project:

Overview

The proposed contents of a new extension program have been developed through a consultation process with the pollination industry. An initial discussion with all stakeholder groups identified the need for the creation of a working group to develop a list of agreed topics appropriate for the pollination industry in eastern Canada. Below is the list of proposed topics.

1. Pollination Efficiencies
2. How to assess hive strength for pollination
3. Transport, placement, and location of hives for pollination
4. Managing agrochemical use during pollination
5. Honey bee and blueberry biology as it relates to pollination
6. Business of Pollination

This year ATTTA has selected a couple of the themes and begun the creation of learning materials, these are: 2. How to assess hive strength; 4. Managing the Use of Agrichemicals during Pollination.

Local vs. import queens:

The purpose of this project is to compare import queens from California with queens reared using grafts from local colonies. Colonies were queened spring of 2020 and the colonies and their queens were followed through last season and into spring this year, comparing colony build up, overwintering success, brood pattern, and temperament. This project helps to encourage a self-sustaining acquisition of healthy, local queens and honey bee colonies in Atlantic Canada.

Queen Rearing:

ATTTA set up a queen rearing operation in 2021 in order to create learning materials around this topic. All activities were video recorded and photographed in order to provide visual aids for teaching and the creation of video content.

Workshops/Presentations

Courses delivered during the 2021 beekeeping season:

- **Fundamentals of Beekeeping – 4 Course Certificate Program**: Fundamentals of Beekeeping is a certificate program designed to help beekeepers improve and expand their colony and operational management skills. Anyone whose primary responsibility and interest is the care and progression of the apiary are encouraged to enroll – apiary persons, hobbyists and upcoming commercial beekeepers looking to improve skills.

Fundamentals of Beekeeping consists of four courses:

1. The Very Beeginnings: In this course, students become familiar with the Atlantic Canadian honeybee industry and acquire the introductory knowledge pertinent to setting up a bee operation.

Topics covered in this course include the following:

- Honey Bee Biology Basics
- ABCs of Setting Up
- Spring Management

- The Atlantic Bee Industry

2. Working Bees & Hive Health: This course covers critical information on maintaining hive health, pest identification and management.

Topics covered:

- Integrated Pest Management
- Biosecurity
- Pests and Diseases
- Swarms and Splits

3. Post-Pollination: Propagation & Products: This course will focus on specific areas of bee management, along with the money-makers: honey and other hive products.

Topics covered:

- Queens: Propagation in the Maritimes
- Honey & Hive Products
- Special Management Cases

4. Season Wrap-Up & Business Growth: This course focuses on the beekeeping operation beyond the summer months.

Topics covered:

- Fall Management
- Winter Preparations
- Business and Beekeeping Beyond the Apiary
- Beekeeper's Calendar

Upon successful completion of the required activities for all four courses, including assessments for each course, participants receive the Fundamentals of Beekeeping Certificate.

- **Newfoundland Intermediate Beekeeping Course:** This course is designed specifically for beekeepers in Newfoundland; to allow local beekeepers to progress in their proficiency and be provided specific information related to Newfoundland beekeeping.
- **Queen Production Course (PEI):** This course is designed to be an introduction to queen rearing. The course begins with introductory biology and genetics of honeybees, then introduces the concept of breeding and how to select ideal breeder colonies. The course then moves into cost considerations and equipment necessary for queen rearing. After these introductions, the steps for queen cell production are discussed in addition to how cells can be handled and treated after production. Finally, the course covers mating and how to create splits and nuc colonies for your queens.
- **Newfoundland Queen Rearing Course:** This course is designed specifically for beekeepers in Newfoundland; to facilitate industry growth through self sufficiency in local queen production given the relatively short beekeeping season and import restrictions in Newfoundland.

<u>Other</u>:

- **Perennia Virtual Field Day informative video – Bees & Blueberries in Atlantic Canada:** In Atlantic Canada, the working relationship between bees and blueberries, and beekeepers and blueberry growers, has been ongoing for many years. Every year, thousands of honey bee colonies are moved into blueberry fields to carry out the task of pollinating blueberry flowers in order to maximize the fruit crop yield. But honey bees aren't the only bee species employed for blueberry pollination; bumble bee colonies are also often moved into blueberry fields to increase the pollination workforce. Honey bees are effective in blueberry pollination thanks to their populous colonies, whereas bumblebees are effective in blueberry pollination due to their ability to perform a specific pollen foraging technique called "buzz pollination". In addition to these managed bee species that are intentionally placed in flowering blueberry fields by berry growers and beekeepers, there

are many native bees and other pollinators that also contribute to the pollination of blueberries thanks to their natural foraging tendencies. Join us as we take a closer look at the relationship between honey bees and blueberries and investigate the different species of bees that contribute to the pollinator group effort of supporting Nova Scotia's most important agricultural industry.

- **Perennia Staff Beekeeping Day:** Perennia staff participated in a hands-on field day in the bee yard, learning about honey bees and beekeeping to allow better understanding of and communication with the beekeeping industry in Atlantic Canada, with emphasis on wild blueberry pollination. As the primary agriculture extension provider in NS, this session allowed Perennia specialists additional insight into honey bees and pollination practices in our region.

- **NSBA Fall Technical Session Oct 16:** ATTTA assisted in the organization and hosting of the annual session. Topics covered provided additional skills and knowledge for the NS beekeeping industry.
- **PEIBA Beekeeping Workshops fall/winter 2021:** These once-a-month workshops are designed to present practical beginner-level beekeeping information and recommendations, to facilitate focussed and further discussions, followed by an open-forum Q&A session.

Articles and Online Activities

What's the Buzz with ATTTA:

- **Blog:** This blog features content about our research and extension resources, industry events, and more. This blog is designed to offer something for everyone – whether a blueberry grower, beekeeper, researcher, or extension agent, we share timely and regional content that impacts the intertwined sectors of beekeeping and wild blueberries. Beekeepers can use this blog as a resource to develop better beekeeping practices in their apiaries and learn about new research findings. Blueberry growers can see how our research goals target building the pollination capacity of honey bees for lowbush wild blueberries.

- **Podcast:** This podcast features conversations with interesting guests from the beekeeping industry. Hosted by the Atlantic Tech Transfer Team for Apiculture and always regionally relevant, this podcast's goal is to provide beekeepers with additional insight into all aspects of the industry. Whether you are a hobby beekeeper, or a large commercial pollinator involved in blueberry or honey production, the podcast will have something interesting.

- **Twitter:** @beeatlantic is all about honey bees, beekeeping, wild blueberries, and pollination. Twitter is used to share ATTTA updates and announcements of new releases, industry-related opportunities, and other notable and related content.

- **Canadian Beekeeping Minutes:** Following the success and positive feedback from our increased online presence and extension, we are very excited to present "Canadian Beekeeping Minutes". This series of quick and informative beekeeping demonstration videos presents practical information and techniques intended for beekeepers of all experience levels.
  - Approaching & Opening a Hive
  - Opening a Hive & Handling Frames
  - Cleaning Hive Tools
  - Installing a Sticky Board
  - Varroa Sampling – Alcohol Wash

- Lighting a Smoker

Involvement

Working on behalf of beekeepers and our industry, ATTTA participates actively with associations at the regional and national level. ATTTA has membership or affiliation with the following Groups:

- Provincial Beekeepers' Associations: NSBA, NBBA, PEIBA, Atlantic BA
- Provincial Blueberry Producers' Associations: WBPANS, BNBB, PEIWBPA
- National: CHC, CAPA

As members/affiliates of these Groups, ATTTA plays a collaborative role in the beekeeping and blueberry pollination industry in Atlantic Canada. Examples of 2021 meeting participation:

- NSBA board meetings
- NSBA strategy meetings
- NSBA Fall Technical Session
- NSBA AGM
- WBPANS board meetings
- WBPANS AGM
- Joint Pollination Committee meetings
- NBBA board meetings
- NBBA AGM
- PEIBA meetings
- PEIBA AGM
- NLBA meetings

MOTION: Motion to accept the Tech Transfer Team Report as submitted
MOVED BY: Marta Guarna
SECONDED BY: Paul Kozak
CARRIED

AAPA Update Report

Judy Wu-Smart, AAPA President

2022 American Bee Research Conference update (virtual meeting)

-The American Association of Professional Apiculturists (AAPA) will not be meeting with the American Honey Producers Association, but there is an interest of continuing a collaboration; there will be an "Update Q&A" session on the status of bee stressors with apiary inspectors and the research community on December 3, 2021.
-The North American Bee Research Conference will be held on January 13 and 14 in conjunction with CAPA and AAPA virtually, with two keynote speakers (Nuria Morfin and Peter Neumann).
-The AAPA is encouraging students to participate, there will be new awards offered this year to undergraduate students. The competition award was separated to allow undergraduate and Master's students to compete with different metrics in their own groups.
-CAPA is likely going to sponsor 1/2 of the student competition awards (pending approval) and AIA is likely going to sponsor 1/2 of the student competition awards.

Treated seed disposal in Nebraska - update

-The case of an ethanol plant that processes the surplus of cover seeds in North America (96% of seeds from North America) is publicly available [http://ecmp.nebraska.gov/publicaccess/viewer.aspx?&MyQueryID=340].
-The facility (which is now closed) is one mile south of an apiary that consistently reported high mortality.
-Regulatory aspects of disposal of treated seeds had come to the attention of researchers, little information on recommendations to dispose cover seeds is available. The wetcake soil [by-product of the processing of cover seeds for their disposal] contains high levels of pesticides (i.e. 554, 000 ppb of clothianidin). The wetcakes were distributed as soil amendments to local farms in 2018-2019, with unknown levels of pesticides residues (there is no requirement to test pesticide levels in the by-product).
-There has been challenges in communicating concerns with state officials and EPA to determine action plans, as enforcement and regulations are lacking.
-Potential hazard to pollinators includes the exposure of nectar and pollen from wild plants growing near the facility.
-Attempts from seeds companies that have used the facility to voluntarily clean the area have been conducted, including the bio-incineration of the wetcake.
-The Pesticide Stewardship Alliance Hazardous Committee (Special Task Force) has the goal of gathering specific contact information from agencies that regulate treated seeds management and disposal, and distributors that sell treated seeds of all the corn producing states [http://seed-treatment-guide.com].

Discussion: The members discussed the regulation of the states to dispose or control the application of treated seeds. Judy also mentioned the use of bees as bioindicators system to show larger problems that point to a public health hazard (e.g. water and air contamination), and the impacts of losing biological network support. Also, the proposal of solutions to treat the seeds prior to their disposal was mentioned, and the need of research on environmental fate of the pesticides.
President Hoover thanked Judy Wu-Smart for her update.

USA Apiculture Report (AIA)
Kim Skyrm, AIA President

AIA provides support int the form of regulatory guidance, education, collaboration, and information with the goal of facilitating management focused on honey bee health, production, pollination and the beekeeping industry.

In 2021, AIA was restructured and now have 18 committees, including: Communication, Standard Operating Procedures, Educational Outreach, Pollinator, Research/Diagnostic Lab, Industry Organizations, Survey/Annual Health Data, Regulatory/Veterinarian, Social media/IT, and Integrated Pest Management.

AIA is a very dynamic group, and their activities in 2021 included the following:

-Virtual meetings continued throughout the year, and more states joined AIA.
-The Newsletter was redesigned [apiaryinspectors.org]
-AIA Collaborative activities included joining conferences, workshops and working groups, publications, and regulatory activities.
-Active collaboration with the Honey Bee Health Coalition.
-Involvement with the North American Pollinator Protection Campaign and the National Association of State Department of Agriculture, including the collection of data of bee mortality related to pesticide exposure and the development of a toolkit on Pesticide Education and Safety.
-Involvement in the American Beekeeping Federation journal and Bee Culture with publications.
-Publication in the Veterinary Clinics Journal, showcasing the work of State and Provincial Apiary Programs.
-Series of webinars on IPM funded by Northeastern IPM Center.

-New England Apiary Inspectors collective was created, with a panel of apiary inspectors to promote honey bee health and seasonal management recommendations with a Q&A section -virtual sessions.
-Virtual in-fiend workshops.
-Package inspections for import (MA)
-Invasive Pest surveys, including the Asian giant hornet.
-Marketing programs of certified honey.
-The Spotted Lanternfly has ascended on the North East. Conversations of containing the distribution of the pest have been addressed.
-The AIA Survey was redesign to record applicable data on honey bee health, the data will be available in 2022.
-The AIA Annual meeting for members will be held in January 11 and 12, 2022 virtually.

President Hoover thanked Kim Skyrm for the update.

Provincial Reports

British Columbia
Provincial Apiarist(s): Paul van Westendorp

BRISTISH COLUMBIA 2021 PROVINCIAL ANNUAL REPORT

Provincial Apiarist(s):	Paul van Westendorp	
BEEKEEPING STATISTICS:	2021	(2020)
Number of Beekeepers:	4,281	(3,686)
Number of Producing Colonies:	61,320	(56,769)
Average Yield/Colony (kgs) & (lbs):	32 kg / 70 lb.	(31 kg)
Total Estimated Crop (Kgs x1000) & (lbs x1000):	1,973,081 kg	(1,774,000 kg)
Colonies Wintered (2020-21):	58,232	
Estimated Percent Winter Mortality (%):	32%	

INSPECTION STATISTICS:

Number of Colonies Inspected:	**2,850 (+2,000 Prairie cols.)**
Number of Beekeepers Inspected:	na

GENERAL COMMENTS:

Wintering comments:

Persistent precipitation and low temperatures resulted in winter mortality of 32% compared to 20% in 2020. Primary causes of mortality reported by beekeepers (in descending order): Weak Colonies in the Fall / Ineffective Mite control / Starvation / Weather. The same causal factors were reported in 2020.
It is surprising that management-related causes continue to be the main contributors to colony loss.

Inspection comments:

- Contrary to beekeeper claims, there has not been a significant increase of EFB prevalence.
- There has been a significant increase of Chalkbrood (CB). It is not clear whether CB has become more virulent or that its increased expression is the result of environmental factors.
- Beekeepers reported lower than usual Varroa mite problems during 2021.
- No SHB sightings have been reported anywhere despite ongoing monitoring.
- 2021 has been marked by heat waves, drought, forest fires and smoky conditions. There was widespread concern about the production year but beekeepers reported a good honey crop of superb quality for most regions.
- Asian Giant Hornet (AGH) *Vespa mandarinia* surveillance continued through 2021 on Vancouver Island and the Fraser Valley. No verified sightings or collection of AGH were reported on Vancouver Island. Its apparent absence since September 2019 allows Vancouver Island to be declared "AGH free".
- The Fraser Valley surveillance program involved the placement of dozens of bottle traps near the Canada-US border. Only one single AGH worker was collected in a Japanese Bottle trap in late September, near the border. This find coincided with the location and subsequent eradication of an AGH nest in Washington State, only a few hundred meters away.
- Washington State located and eradicated three nests in the general area east of Blaine WA during 2021, while there were far less sightings of AGH specimens compared to 2020.
- Resumption of surveys in the Fraser Valley and Washington are planned for 2022. A key component is public participation by reporting suspected sightings.

Alberta
Provincial Apiculturist: Samantha Muirhead

ALBERTA 2021 PROVINCIAL APIARIST ANNUAL REPORT

Provincial Apiarist: Samantha Muirhead

A. Beekeeping Statistics

. No. of Beekeepers: 1837 (still waiting on beekeepers to register)
. No. of Producing Colonies: 317,829
. Average Yield/Colony (lb & kg): NA
. Total Estimated Crop: NA
. Colonies Wintered (2020/2021): 265,814
. Estimated Percent Winter Mortality (%): 25%, (31% including non-viable colonies)

B. Inspection Statistics

. No. of Colonies Inspected: 2129
. No. of Beekeepers Inspected: 83

C. General Comments

Wintering comments:
Only 83 out of 170 beekeepers responded to the overwintering survey and the reported winter kill was 23%, or 31% if you include non-viable colonies. The winterkill reported from the survey was close to what was calculated through register beekeepers (25%).

Beekeepers in Alberta have a range of overwintering methods and what method used affected their overwintering success. Overwintering colonies in British Columbia (BC) usually results in low winter losses. However in 2020, beekeepers reported a 48% winterkill. Although speculations can be made, it is uncertain why the winterkill was so high in 2020-2021.

Winter mortality vs wintering method (Based on survey results)

Wintering method	Winterkill	% of Alberta's colonies wintered using method	Number of beekeepers using overwintering method*
Outdoors - Alberta	24%	77%	76
Indoors - Alberta	17%	18%	18
British Columbia	48%	5%	7
Average	23%		

*beekeepers use more than one wintering method

Due to the warmer than average winter in 2020-2021, beekeepers were able to put their spring *Varroa* mite treatments into their colonies much earlier. However, inspections revealed that even after treatments, average mite levels where around (~1%). At this point, it is unknown known why mite levels remained high after treatments (varroa control failure, incorrect dose, brood present in colony, unsuitable temperatures, etc.). This was also captured in the survey where beekeepers reported that the number one cause of winterkill in Alberta was *Varroa* mite control failure.

Inspection Comments:
There were 103 inspections done on 83 beekeepers throughout the season. With the exception of equipment only, all inspections had samples collected for Varroa mites, Nosema, diseased larvae, and an apiary level 'risk' for EFB and AFB. The 'risk' is a composite sample of live bees taken from inspected colonies in an operation, regardless of whether clinical symptoms were found. All EFB and AFB sample testing was done at the National Bee Diagnostic Centre. If AFB was detected, it was further tested to determine the susceptibility to available antibiotics. The results of these samples allow beekeepers to determine if EFB or AFB could potentially be an issue if not properly managed, and also helps them access antibiotics from a veterinarian if required.

Percent of inspected beekeepers who had EFB or AFB detected in 2021*

Disease	Larval	live bee (compiled apiary sample)
EFB	33%	68%
AFB	12%	20%

*As of the date reported, still more results pending

Although EFB was detected in 68% of operations inspected, the level of the infection in colonies was much less severe than what was reported in 2020, where a number of colonies were culled in order to control the infection. This could be a result of hotter, dryer weather, which put less stress on the colonies, however this is still to be determined.

Of the 12 beekeepers who had positive findings of AFB in their operation, three had AFB resistant to Terramycin.

Due to increased reports in Alberta of Apivar *Varroa* control failures, Alberta's Bee Health Assurance team worked with the Alberta Technology Transfer team and Dr. Rassol Bahreini, in creating a program for beekeepers to have their mite population tested for Apivar "resistance". This program required beekeepers to collect and mail in samples of mite-infested bees to be tested. Only 11 beekeepers signed up and of those 11, only 5 sent in samples. We had anticipated a much higher participation rate and although the results weren't promising, 5 beekeepers was not enough to make a determination on the effectiveness of Apivar across the Province. Nonetheless the results are very concerning. This test was based on the Apiarium method (Bahreini et al. 2021), where after 6 hours the mite kill was determined. Average mite kill for each beekeeper was as follows: 85%, 24%, 80%, 29%, and 51%, respectively. There is a plan to continue with this program in 2022 with some revision to capture more participants across the province. Many beekeepers struggled to control *Varroa* mites this season, which underlines the need for new application methods for organic options as well as a summer treatment.

Average Nosema and *Varroa* mite infestations - 2021

Pest/Disease	Spring	Summer	Fall
Nosema	2,242,740	528,798	*168,669
Varroa mite infestation	1%	1.6%	**2.6%

*At time of report only 8 out of 36 beekeepers had their samples processed so final average will change
** Based on field shakes, at time of report only a few samples had been processed in the laboratory as such this number will change.

Nosema infestations were once again above 1 million spores per bee (2.2 million spores per bee) in the spring. This is slight improvement from 2019 and 2020 where levels were 3.9 and 5.7 million spores per bee, respectively. Again, these levels are still concerning. *Nosema apis* and *Nosema ceranae* was not differentiated in laboratory tests. At the time of reporting, *Nosema* samples are still being processed so fall numbers are not complete.
As mentioned, *Varroa* mite levels were at the treatment threshold of 1% in spring 2021, this is after many of the inspected beekeepers had already applied *Varroa* treatments. Of the inspected beekeepers, approximately 48% treated with oxalic acid in the spring and 35% treated with Apivar. The remaining 17% used a combination of organic treatments or Apivar followed by an organic treatment. In fall *Varroa* mite infestation levels were approximately 2.6%. After inspections we received calls of levels continuing to increase. Although, average mite levels were close to or at threshold, inspectors documented high levels of brood damage due to mites. Approximately 68% of beekeepers inspected were treating with Oxalic acid or formic acid. The remaining 32% were using Apivar alone or Apivar with an organic acid follow up treatment. Further analysis still needs to be done to determine if one treatment performed better than the other for both the spring and fall.

Production comments: Statistics on honey production has yet to be determined.

Manitoba
Provincial Apiarist: Rhéal Lafrenière & DLJ Consulting (Inspection Services Contractor)

MANITOBA 2021 PROVINCIAL APIARIST ANNUAL REPORT

Name and Job Title: Rhéal Lafrenière (Provincial Apiarist) & DLJ Consulting (Inspection Service Contractor)

A. Beekeeping Statistics

. No. of Beekeepers: 930
. No. of Producing Colonies: 115,707
. Average Yield/Colony (lb & kg): 160.8 lbs (73.1 kg)
. Total Estimated Crop (lb & Kg x1000): 18,605.7 lbs (8457.1 kgs) x1000
. Colonies Wintered (2020/2021): 118,697
. Estimated Percent Winter Mortality (%): 15.4%

B. Inspection Statistics

. No. of Colonies Inspected: 5530
. No. of Beekeepers Inspected: 265

C. General Comments

Wintering comments (for example: provincial winter survey results synopsis (3 paragraphs)**:**

- The percent colony mortality in Manitoba this past winter was 15.4%. Given that the typical range for wintering loss is between 15 to 25 percent, this year's wintering losses would be considered on the low side of typical losses.
- The average losses in Manitoba for commercial colonies wintered indoors was estimated to be 17.4% and outdoors 13.2%. We also collected winter loss data from non-commercial beekeepers (<50 colonies) and the average percent losses were slightly higher than the commercial beekeeper losses at 18.9%.
- Since 2010, only in 2011 and 2013 was the average loss value in Manitoba higher than 25 percent, suggesting that losses in Manitoba since 2013 have been relatively stable for most beekeepers. Losses in Manitoba have consistently been lower than the national average since 2016.

Inspection Comments (for example: inspection program priority setting, disease inspection and analysis synopsis (3 paragraphs):

- The honey bee inspection program in Manitoba was again contracted out to a 3rd party Inspection Service Contractor. 2021 was the first year of the two-year contract with DLJ

Consulting.

- The target for this season's inspection program was to inspect approximately 5450 colonies and the program exceeded the target with over 5500 colonies inspected. One (1) cases of AFB and two (2) cases of EFB were confirmed through the Inspection program and Veterinary Diagnostics Services Lab this season.
- There were additional cases of AFB and EFB reported through producer submitted samples to the lab, which will be followed up by the inspection program next season to determine if the incidence is detectible at the level of inspection offered by the inspection service provider.

Production comments (for example: honey production statistical data collection and information synopsis (3 paragraphs):

- Given the extremely dry conditions throughout the province the amount of honey produced in Manitoba this season appears to be only slightly below average. Based on preliminary data from the *2021 Honey Bee and Honey Production Survey*, the provincial average honey production per colony is estimated to be 161 lbs (i.e. 73 kg/colony). The average long term honey yield in Manitoba is estimated to be 170 lbs/colony.
- This year's production survey was done primarily through an online eForm. Participation in the survey was very good with over a 150 beekeepers contributing to the survey results. Colony number representation in the dataset was also very good with over 62,000 colonies reflected in that data.
- Overall, the beekeeping industry in Manitoba continued to demonstrate resilient and resourcefulness in the face of challenges associated with the drought and the Covid-19 pandemic. Not that anyone would want to repeat 2021, but in terms of coping as an industry, Manitoba beekeepers did what they needed to do to come out on top.

Ontario
Provincial Apiarist: Paul Kozak (Ontario Ministry of Agriculture, Food and Rural Affairs)

2021 PROVINCIAL APIARIST ANNUAL REPORT

Name and Job Title: Paul Kozak – Provincial Apiarist / Apiary Specialist; Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)
Data summarized by: Wael Haddad (Apiary Data Coordinator, OMAFRA)

A. Beekeeping Statistics (as of data summarized on Nov 1, 2021)

. No. of Beekeepers: 3,172 (registered with an active renewal status)
. No. of Producing Colonies: 101,778
. Average Yield/Colony (lb & kg): 62.56 lb / Colony; 28.38 kg / Colony
. Total Estimated Crop (lb & Kg x1000): 6,401,640 lb; 2,904,068 kg
. Colonies Wintered (2020/2021): 101,778
. Estimated Percent Winter Mortality (%): 17.8%

B. Inspection Statistics (as of data summarized on Nov 2, 2021)

. No. of Colonies Inspected: 5,428 Brood Nest / 9,647 Top Bar

. No. of Beekeepers Inspected: 240 beekeepers

No. of Yards Inspected: 468 bee yards

C. General Comments

Winter Loss

- The level of winter loss for commercial beekeepers was estimated to be **17.8%** which is just above the sustainability threshold of 15% as defined by apiary specialists. As in most years there were commercial beekeepers who were above and also below this level. The results were slightly higher for hobbyist / non-commercial beekeepers. In Ontario, OMAFRA's Apiary Program analyzes data from commercial beekeepers (those beekeepers operating 50 or more colonies) and non-commercial beekeepers (those beekeepers operating 49 or fewer colonies) beekeepers as two distinct populations.

- The results for beekeeper management of pests and diseases was very encouraging for the commercial sector in Ontario (https://capabees.com/shared/CAPA-Statement-on-Colony-Losses-2020-2021.pdf)

- Reasons cited for winter loss by commercial beekeepers were poor queens, weak colonies in the fall, ineffective Varroa control, and weather.

Varroa

- Management: up to 84% of commercial beekeepers are monitoring for varroa one or more times per year while 38% are monitoring three or more times per year. While this seems very encouraging, this also means that 16% of commercial beekeepers are not monitoring at all.

- Preliminary analysis of the different trends between commercial and hobbyist beekeepers shows hobbyist beekeepers have higher losses and monitor less frequently.

- There were numerous issues related to varroa mites that were identified and reported by beekeepers. One issue included honey bee colonies crashing in mid-summer due to high levels of varroa. High varroa levels may have been related to the very early development of colonies from early spring weather thereby providing varroa mites with an early start in their reproduction and an increase in their populations within honey bee colonies.

- Another issue for Ontario beekeepers was access to Apivar® in summer. This was due to delays in shipment of Apivar® to beekeeping vendors. Because of this there were numerous commercial beekeepers who either had to delay their varroa treatments or use alternative products at a critical time for varroa control. The Canadian Honey Council worked closely with vendors to ensure that supplies were accessed as quickly as possible. While supply chain issues likely influenced this situation, this highlights the importance of early planning for supplies at a national level, between vendors and with consideration of all regions of Canada.

- While there are also concerns that there may be varroa that are resistant to amitraz (Apivar®), there is no direct confirmation of this at the present time. Failure of Apivar® may be mistaken for other factors such as beekeepers not applying the product according to label

instructions; not waiting long enough for the treatment to work; very high levels of varroa or lack of proper monitoring for varroa levels. The most recent work on amitraz resistance in Ontario can be accessed here: https://www.oahn.ca/resources/surveillance-on-resistant-varroa-destructor-mite-population-to-three-synthetic-acaricides-in-ontario/

Inspection Comments

AFB % yards: 2.35%
No. of AFB yards: 11
AFB % colonies 0.48%
No. AFB colonies: 26

EFB % yards:
No. of EFB yards: 9 total / 6 unique *one yard was EFB+ on three separate inspections.
EFB % colonies
No. EFB colonies: 32

SHB % yards:
No. of SHB yards: 52 total and 49 unique yards as of Nov 1st, 2021.
SHB % colonies N/A
No. SHB colonies: 652 SHB positive colonies from inspection summaries as of Nov 1st, 2021.

- **Production Comments:** There were many operations that reported a major decline in honey production during the 2021 season. Many of these operations made some honey in late June / early July but no additional or surplus honey crops after this time. In some cases, beekeepers had to take precautions so that their colonies did not starve during summer. As usual, this varied to a certain degree by area, beekeeping operation, and even from bee yard to bee yard with some locations and beekeepers reporting average to above average honey crops.

Quebec
Provincial Apiarist: Gabrielle Claing

QUEBEC 2021 PROVINCIAL APIARIST ANNUAL REPORT

Name and Job Title: Gabrielle Claing, substitute provincial apiarist for Québec

A. Beekeeping Statistics

. No. of Beekeepers: **1 562**
. No. of Producing Colonies: **59 974**
. Average Yield/Colony (lb & kg): **21.6** kg/n, for beekeepers > 5 colonies ISQ, 2020[1])

[1] https://statistique.quebec.ca/fr/fichier/faits-saillants-de-lenquete-sur-lapiculture-au-quebec-enquete-2020.pdf

. Total Estimated Crop (lb & Kg x1000): **1 359.6** t, for beekeepers > 5 colonies (ISQ, 2020[2])

. Colonies Wintered (2020/2021): **55 508** (according to 2020 registration[3])

. Estimated Percent Winter Mortality (%): **20.56 %**

B. Inspection Statistics

. No. of Colonies Inspected: **2 518** colonies inspected (8 834 colonies present)

. No. of Beekeepers Inspected: **174** beekeepers inspected (238 interventions)

C. General Comments

Wintering comments (for example: provincial winter survey results synopsis (3 paragraphs)**:**
According to beekeepers, mortality is attributable to weak colonies in the fall, varroa mites, problems with queens and unfavorable weather conditions.
About two-thirds (68%) of beekeepers screen for Varroa. The varroa treatments used by the greatest number of beekeepers are based on organic acids, while amitraz (Apivar®) is the miticide applied in the greatest number of colonies.
Fumagillin is used by 1% of beekeepers (10% of colonies) for the control of nosemosis.
Oxytetracycline is used by 1% of beekeepers (16% of colonies) for the control of American foulbrood.

Inspection Comments (for example: inspection program priority setting, disease inspection and analysis synopsis (3 paragraphs):
The majority of inspections are carried out by request of beekeepers who suspected a disease or a problem in their hives or who need a health attestation by our bee veterinarians. Small hive beetle (SHB) surveillance is the only one mandatory surveillance in Québec.
In 2020, an illegal introduction (by a Qc's beekeepers' supplier) in the spring led to the discovery of 24 positive apiaries (24 beekeepers) in 7 different regions.
Follow up inspections in 2021 confirmed that all but one of these apiaries had regained a negative status.

For 2021, active surveillance for SHB was carried out in all regional county municipalities (RCM) where SHB cases were confirmed in 2020 as well as RCMs along the borders with the United States in August and early September. 101 inspections were carried out, during which 995 colonies were inspected by Top bar inspection and Beetle Bee Gone (BBG) traps installed during 10 to 14 days. These colonies were located in 117 apiaries hosting 1,228 colonies.
Notification of SHB infestation is mandatory in Québec since 2012, thus multiples SHB cases were reported in apiaries of those at risk regions that had not been targeted by this random surveillance system. 38 inspections or follow-up inspections related to reportable diseases (mainly SHB, some AFB) were carried out in 52 apiaries, in which 316 colonies out of 342 were inspected.

[2] *Idem.*
[3] Registration difficulties linked to pandemic in 2020, probable underestimation.

In total, 11 new SHB positive apiaries were found in 2021, all in Montérégie and Estrie regions. 6 of these apiaries are located in RCMs along the US border (le Haut-Richelieu, les Jardins-de-Napierville, Brome-Missisquoi). This increase in border incursions, mostly detected through self-reports, could be attributed to the efforts made this Spring to increase awareness. The other 5 positive apiaries, belonging to 3 beekeepers, are located in the Rouville and la Vallée-du-Richelieu area and are linked to the contaminated shipment from 2020. Voluntary quarantines and treatment recommendations were issued.

Visual Top bar inspection was done in 320 Ontarian hives placed in Quebec's blueberry fields (29% of 1096 introduced hives) and in 238 Ontarian hives placed in Quebec's cranberry fields (32% of 732 colonies).

Visual Top-bar inspection was done in 100% of the 24 hives bought in Ontario by Quebec's beekeepers.

MAPAQ continues to investigate suspected cases of bee poisoning by pesticides as reported by beekeepers (mainly targeting acute poisoning). For 2021, 9 declarations led to an investigation by MAPAQ staff. In one of these suspicions, the concentration of pesticides in bees was high enough to explain the observed acute mortality (the responsible molecule being clothianidin). In another case, no pesticides could be detected in the bees, but a worrying mix of pesticides was found in honey from the affected hives (clothianidin, thiamethoxam and dimethoate). Unfortunately, these analyzes were carried out for information purposes only as the interpretation of analyzes made on honey remains hazardous and difficult.
As in 2020, we noticed a continued increase in foulbrood problems (AFB and EFB) during our field inspections (clinical signs + lab confirmation). No AFBr strain was detected in the 20 samples tested in 2020.

Production comments (for example: honey production statistical data collection and information synopsis (3 paragraphs):
The questionnaire and the collection method have been revised by ISQ for the 2020 survey. Comparisons of the 2020 data with those of previous years should therefore be done with caution. The changes made have an impact on the figures for sales and total values for beekeeping production, because the stocks of the previous year and the purchases made during the year from other beekeepers in Quebec or located outside Quebec are no longer taken into account in the sections relating to production and sale of products. So there is a break in the time series.

Newfoundland
Provincial Apiarist: Karen Kennedy

NEWFOUNDLAND 2021 PROVINCIAL APIARIST ANNUAL REPORT

Provincial Apiarist: Karen Kennedy – Newfoundland and Labrador

A. Beekeeping Statistics

. No. of Beekeepers: 14 of 15 reported (small scale & commercial producers)
. No. of Producing Colonies: 694 total colonies; 169 producing colonies
. Average Yield/Colony (lb & kg): 57lbs / 26kg
. Total Estimated Crop (lb & Kg x1000): 8,800lbs (**N.B.**: not multiplied by 1,000)
. Colonies Wintered (2020/2021): 2020: 677 colonies. 2021: 608 colonies
. Estimated Percent Winter Mortality (%): 13.5%

B. Inspection Statistics

. No. of Colonies Inspected: 119 colonies
. No. of Beekeepers Inspected: 12

C. General Comments

Wintering comments (for example: provincial winter survey results synopsis (3 paragraphs)**:**
The estimated winter bee mortality for the 2019-2020 season was 15%. The estimate was taken from the 10 commercial beekeepers (>20 colonies) and the four new small-scale beekeepers (10-20 colonies). This was the first year where small-scale beekeepers are included in reported numbers, and thus losses may be larger than previous reported numbers/years. The 2021 Winter Loss Survey determined that the actual overwinter loss was 18.1% (outdoor) and 0% indoor.
The estimated percent winter mortality for the 2020-2021 winter is 13.5% loss. This estimate was obtained to include both the commercial and small-scale beekeepers, and actual percentage will be confirmed in Spring 2022.

Inspection Comments (for example: inspection program priority setting, disease inspection and analysis synopsis (3 paragraphs):
Inspections are not currently mandatory; however, the commercial and small-scale beekeepers are quite accommodating and supportive.
87% of commercial beekeepers were inspected in the 2021 field season. The PA and a technical assistant inspected all but two commercial beekeepers. From these inspections, it was documented that that were no Varroa, SHB, HBTM, GWM, AFB or EFB found in the colonies inspected. Alcohol wash was used to test for Varroa. Nosema was the only pest documented, which is a common occurrence. NL maintains its pest-free status.

Production comments (for example: honey production statistical data collection and information synopsis (3 paragraphs):

The Honey Bee Development Program was created in 2020 and from this program we saw an insurgence of small-scale beekeepers, as well as an increase in colony numbers. Due to this, existing beekeepers were able to grow their numbers and offer more nucleus colonies for sale (due to hive equipment being funded under this program).

Wasps were not prolific this season as they had been in the previous year. Summer went very well, as Newfoundland and Labrador, (and other Atlantic Provinces) had a two-week earlier spring than traditionally experienced historically throughout previous years. This early summer brought an earlier brood, and many splits were created throughout this summer. No droughts were experienced and no dearths were documented. Honey yields are expected to be on par with previous years.

PEI
Provincial Apiarist: Cameron Menzies

PRINCE EDWARD ISLAND 2021 PROVINCIAL APIARIST ANNUAL REPORT

Name and Job Title: Cameron Menzies – PEI Berry Crop Development Officer/ Provincial Apiarist

A. Beekeeping Statistics

- No. of Beekeepers: N/A
- No. of Producing Colonies: N/A
- Average Yield/Colony (lb & kg): N/A
- Total Estimated Crop (lb & Kg x1000): N/A
- Colonies Wintered (2020/2021): 5,500
- Estimated Percent Winter Mortality (%): 16.1%

B. Inspection Statistics

- No. of Colonies Inspected: 0
- No. of Beekeepers Inspected: 0

C. General Comments

Wintering comments (for example: provincial winter survey results synopsis (3 paragraphs)**:**
The 2020/ 2021 winter proved to be another successful winter for overwintering honey bee colonies on PEI. This marks the second winter with relatively low colony loss and the best winter on record for the province. Due to the small size of the industry on PEI, the low overwinter loss is largely attributable the successes of our largest beekeepers. For instance, our largest beekeeping operation – which manages close to half of the hives in the province – had a decent winter (15% loss). Other mid-sized commercial operations on PEI have been improving their overwintering over the last few years. The median overwinter loss improved from 33.4% in 2019 to 10.5% in 2020 and 12.5% in 2021. PEI beekeepers, having been dismayed by three years of high overwinter losses, are taking otherwise overlooked threats to colony loss, like shrews and moisture control, more seriously.

Freezing temperatures certainly did not arrive early last year (Christmas 2020 was 11 degrees in Charlottetown). Beekeepers did not have the excuse of too little time to feed their hives last winter year. The 2020/ 2021 winter was the second mild winter in a row. The number one cited cause for hive loss both in 2018 and 2019 was “poor weather”. In 2020, the number one cause cited was by far starvation and in 2021, was poor queens. “Poor queens” was listed as the #2 cause in 2020; it is possible that issues with queen shipment related to COVID-19 travel disruptions is to blame for poor queen performance the last couple years.
The weather in the 2021 beekeeping season was generally favourable on PEI; there was amble rain in the mid-summer and there were no devastating drought-caused nectar dearths. Beekeepers reported strong colonies this fall which is hopeful because “weak colonies in the fall” was listed as the #2 cause of colony death over the 2020/2021 winter. Environment Canada predicts another winter with above-average temperatures in Atlantic Canada, providing further hope for another successful winter.

Inspection Comments (for example: inspection program priority setting, disease inspection and analysis synopsis (3 paragraphs):
Due to travel restrictions related to the COVID-19 pandemic, the Provincial honey bee inspectors for PEI who routinely travel to the province from off-Island were not able to perform inspections on PEI this summer. However anecdotally, I can report from my own observations as the Provincial Apiarist and through conversations with Island beekeepers, varroa mite pressures were greater than normal this year, partly due to the lack of access to synthetic varroa mite treatment options in 2021. Wax moth has become a greater issue for beekeepers in recent years too. Several beekeepers have lost a significant amount of stored drawn comb due to the pest.

Production comments (for example: honey production statistical data collection and information synopsis (3 paragraphs):
Honey production is typically not the main priority of commercial beekeepers on PEI. Some who pollinate wild blueberries do not even bother collecting honey. For those who do, a honey yield of about 50 lbs per hive is to be expected in an average year. I do not have official numbers yet for 2021 because beekeepers are still busy extracting honey. I can anecdotally report though, that sue to the favourable weather this summer, honey extractors are dealing with above average amount of honey in their hives. I expect a greater average than the typical 50 lbs per hive.

Beekeepers are having to adapt to exploring different honey markets as the crop profiles on PEI change. For instance, potato growers have been implementing buckwheat into their crop rotations in an effort to control wireworms. Buckwheat is of course highly attractive to honey bees but beekeepers who relied on markets that demand a lighter honey are experiencing difficulty selling the dark honey produced from buckwheat nectar.
Due to the high demand in the PEI Pollination Expansion Program, the relatively high blueberry price leading to high pollination demand (for the second year in a row), and the favourable weather this summer, PEI beekeepers made the largest expansion of their operations in the last several years. It is likely that we are putting 15% - 20% more hives into this winter than last.

Many beekeepers are making an effort to grow their operations in order to close the gap between the demand for hives and the supply but it does not appear that demand will be met soon. The wild blueberry field price was the highest in 2021 than it had been in several years as well and is likely to remain high in 2022, only increasing the demand for hives even further, which must be met by importing hives from off-Island.

New Brunswick
Provincial Apiarist: Chris Maund

NEW BRUNSWICK 2021 PROVINCIAL APIARIST ANNUAL REPORT

Name and Job Title: Chris Maund (Integrated Pest Management Specialist (Entomologist) and Provincial Apiarist)

A. Beekeeping Statistics
. No. of Beekeepers: 495
. No. of Producing Colonies: 13,250 total colonies (9,175 producing honey)
. Average Yield/Colony (lb & kg): 44 / 20
. Total Estimated Crop (lb & Kg x1000): 403.8 / 183.2
. Colonies Wintered (2020/2021): 12,963
. Estimated Percent Winter Mortality (%):13.2

B. Inspection Statistics
. No. of Colonies Inspected: 367
. No. of Beekeepers Inspected: 72

C. General Comments

Wintering comments: An estimated 12,963 colonies were overwintered in the fall of 2020. Beekeepers with 50 or more colonies were surveyed. Respondents had 76% of the colonies in NB. The average winter loss from 2020 to 2021 was 13.2%. There was no main cause of winter losses. Fifty seven percent of respondents treated for varroa in the spring and summer/fall and 100% of respondents treated for varroa in the summer/fall.

Inspection Comments:
European foulbrood (EFB): Five colonies had EFB, comprising five beekeepers.

American foulbrood (AFB): Seven colonies had AFB, comprising three beekeepers. An AFB sample was tested and was susceptible to tetracycline. Despite this relatively high level, for NB, of reporting a foulbrood disease in one year, all beekeepers except one had reported a foulbrood disease before.

Chalkbrood: Chalkbrood disease is only recorded when the colonies were not considered to thrive due to high chalkbrood levels. Five colonies from three beekeepers had these high levels of chalkbrood.

Small hive beetle (SHB), *Aethina tumida* (Murray): Two SHB adults were reported from an NB honey bee colony on 6 Oct. 2021 from Charlotte County in southeastern NB. The New Brunswick honey bee colonies had been near (0.5 km) Ontario honey bee colonies which had been imported for wild blueberry pollination in

June 2021. The Ontario honey bee colonies originated from an area in Ontario where the small hive beetle is known to occur.

Varroa mite: The inspection program does not include monitoring for varroa mite levels, although this may be done on a case-by-case basis.

Fact sheet: A fact sheet on monitoring for the small hive beetle was placed on the department's web site in English (**Traps used for Monitoring the Small Hive Beetle in New Brunswick Honey Bee Colonies)** and French (**Pièges servant à la surveillance du petit coléoptère des ruches dans les colonies d'abeilles domestiques au Nouveau-Brunswick)** versions.

Production comments: Honey production was higher in 2021, compared to recent years, due to less drought.

Nova Scotia
Provincial Apiarist: Jason Sproule

NOVA SCOTIA 2021 PROVINCIAL APIARIST ANNUAL REPORT

Name and Job Title:

A. Beekeeping Statistics

- No. of Beekeepers: 886
- No. of Producing Colonies: N/A
- Average Yield/Colony (lb & kg): N/A
- Total Estimated Crop (lb & Kg x1000): N/A
- Colonies Wintered (2020/2021): 24,827
- Estimated Percent Winter Mortality (%): 12.3%

B. Inspection Statistics

- No. of Colonies Inspected: 997
- No. of Beekeepers Inspected: 161

C. General Comments

Wintering comments (for example: provincial winter survey results synopsis (3 paragraphs)**:**

- Gentle winter, not very cold, reported losses were low.
- Shrews continue to be a winter problem where multiple colonies are wiped out.

Suspect issue is under-reported and under-realized and mortality may be blamed on other factors.

Inspection Comments (for example: inspection program priority setting, disease inspection and analysis synopsis (3 paragraphs):

- AFB was identified and spread to 5 bee yards in urban Cole Harbour and Dartmouth

areas. A survey was carried out to determine the extent of the disease. Approximately 50 bee yards withi9n a 7.5 km radius of AFB+ yards were inspected in early October

- AFB was also found late 2020 in Cape Breton and a survey of beekeepers at risk was conducted in early spring with no further detections found.
- One case of A-typical EFB was identified prior blueberry pollination. Affected hives were destroyed.
- Generally, inspectors aim to exceed the 10% (per yard) inspection requirement. An average 65% of all hives present in bee yards are examined.
- This year's saw higher mite loads than in the previous 2 years, especially towards the end of the season in small scale operations.
- The NSDA continues to monitor for SHB by placing traps in hives along NB border. This is seen as most likely route for natural dispersal into Nova Scotia. No SHB were recovered from approximately 25 traps.

Continue to maintain a closed border.

Production comments (for example: honey production statistical data collection and information synopsis (3 paragraphs):
Generally speaking this was an excellent year for beekeepers. We received a lot of swarming reports throughout summer. In spite of swarms, beekeepers reported good colony expansion, and honey production. Blueberry growers reported good pollination, production and FGV (~80 cents per lb). This implies cash on hand for colony rentals in 2022.

Elections
Medhat Nasr

Nomination chair Medhat Nasr called for nominations for the positions of President, Vice president, Secretary, and Treasurer. The following nominations were received from the floor:

Nominations for President:
Ernesto Guzman-Novoa, Nominated **(Elected)**. Elected by acclamation.

Nominations for Vice-President:
Renata Borba, Nominated **(Elected)**
Paul Kozak, Nominated

Nominations for Secretary:
Nuria Morfin, Nominated **(Elected)**
Paul Kozak, Nominated

Nominations for Treasurer:
Stephen Page, Nominated **(Elected).** Elected by acclamation.

Elections to the Executive of CAPA for 2022/23 included one president, two vice-presidents, two secretaries, and one treasurer.

Committee Selection
Ernesto Guzman

President Ernesto Guzman reviewed the membership of each Committee and revised accordingly with input from the membership.

2022 CAPA Executive & Committees

Executive	Ernesto Guzman	President
	Renata Borba	Vice-President
	Shelley Hoover	Past-President
	Nuria Morfin	Secretary
	Stephen Page	Treasurer

Standing Committees

IPM
Nuria Morfin and Rassol Bahreini — Co-Chairs
Andrew Byers, Cassandra Docherty, Chris Mund, Colette Mesher, Derek Micholson, Erika Plettner, Ferland Julie, Claing Gabrielle, Graham Parsons, Jason Sproule, Medhat Nasr, Nicolas Tremblay, Paul Kozak, Renata Borba, Rhéal Lafrenière, Samantha Muirhead, Steve Pernal, Tom Thompson, Valérie Fournier.

Importation and Bee Movement
Samantha Muirhead and Paul Kozak — Co-Chairs
Alexandra Panasiuk, Gabrielle Claing, Graham Parsons, , Medhat Nasr, Nuria Morfin, Olivia Herdt, Rob Currie. All Provincial Apiculturists ex officio

Research
Marta Guarna — Chair
Amro Zayed, Heather Higo, Leonard Foster, Medhat Nasr, Olav Rueppell, Rassol Bahreini, Pierre Giovenazzo, Stephanie Otto, Valérie Fournier.

Awards
Martine Bernier — Chair
Cameron Menzies, Dan Borges, Mylee Nordin, Paul van Westendorp, Rhéal Lafrenière, Rob Currie, Samantha Muirhead.

CBRF
Marta Guarna — Chair
Marta Guarna and Paul van Westendorp — CBRF Board members, CAPA reps.

Tech Transfer
Nicolas Tremblay — Chair

Andrew Byers, Colette Mesher, Daniel Borges, Derek Micholson, Nuria Morfin, Miriam Bixby, Medhat Nasr, Martine Bernier, Monica Winkel, Renata Borba.

Archives
Rob Currie Chair
Gard Otis, Kelsey Ducsharm, Mark Winston, Melanie Kempers.

Non-Apis pollinators
Graham Parsons and Paul van Westendorp Co-Chairs
Alison McAfee, Cassandra Docherty, Daryl Wright, Gail MacInnis, Heather Higo, Lora Morandin, Nicolas Tremblay, Paul Kozak, Rob Currie, Susan W. Chan, Valérie Fournier,

Publications
Stephen Pernal Chair
Janet Tam, Nicolas Tremblay, Martine Bernier.

Communications
Kelsey Ducsharm Chair
Cameron Menzies, Nicolas Tremblay, Melanie Kempers, Monica Winkel, Paul Kozak, Renata Borba, Rhéal Lafrenière, Rob Currie.

National Winterloss Survey
Gabrielle Claing and Julie Ferland Co-Chairs
Medhat Nasr, Melanie Kempers, Stephen Pernal.
All Provincial Apiculturists ex officio.

Africanized bees
Amro Zayed Chair
Alvaro de la Mora, Medhat Nasr, Paul Kozak, Rhéal Lafrenière, Samantha Muirhead, Steve Pernal.

ACTION ITEM: CAPA executives to consider forming a new CAPA committee: 'sustainability committee'.

MOTION: Motion to approve the committee selection
MOVED BY: Rob Currie
SECONDED BY: Paul van Westendorp
CARRIED

Other business

Pierre Giovenazzo CAPA Task force

Pierre suggested to create a CAPA task force on "Domestic stock sustainability", with the goal of address the problem of lack of domestic stock and find solutions.
The CAPA Domestic Stock Sustainability Task Force would start with a meeting in Québec city. I am confident (tentative date, March 2022), with a suggestion of a two-day meeting with scientific presentations from participants that have done work on sustainable stock, and a discussion to brainstorm and propose a working strategy for the task force,

ACTION ITEM: CAPA executive will meet to discuss the support of the CAPA task force on “Domestic stock sustainability, and the role of CAPA.

Meeting adjourned at 4:12pm (CST).

MOVED BY: Paul van Westendorp
SECONDED BY: Paul Kozak

Appendix 1: CHC Report
Rod Scarlett, CHC executive director

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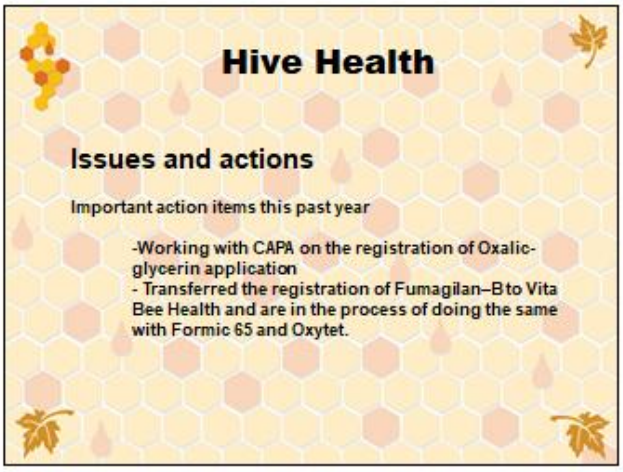

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Hive Health
Other activities

- Support for screening new potential varroacides.
- Administration on the Canadian Bee Research Fund and involvement in the distribution of funds to Canadian bee research projects.

5

Food Safety

- Examining the issues surrounding MRL's for glyphosate in honey with an emphasis on export markets. Concern with residue levels of Quinclorac.
- Continue to push for comprehensive testing of all imported honey by the CFIA
- Supporting Dr. Leonard Foster work on mass spectrometry for honey testing
- Working on getting industry buy-in on standardized testing of domestic honey as well as developing a Canadian definition of honey
- Contributor to the Apimondia Statement on Honey Fraud

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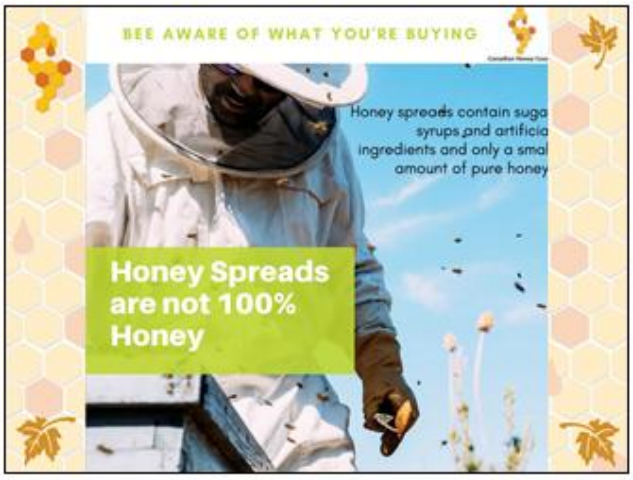

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9

Labour

- Arranged charters for employers of Nicaraguan workers in the spring
- Over 300 Nicaraguans involved
- Involved in all discussions involving Temporary Foreign Workers and Covid 19 issues such as housing and quarantines.
- Concerns with tfwp requirements in the spring. ie. vaccination passports, vaccine acceptance,

10

Labour

- Developing a series of training videos with the Canadian Agricultural Human Resource Council for employees on such topics as biosecurity, seasonal management, worker health and safety and moving bees for pollination

11

Other achievements and Covid Concerns

- Continued problems in bringing packages in from New Zealand, Australia and Chile.
- CFIA approval for queens from Malta, Italy and the Ukraine. Questions on how and who make requests
- Implications on stock importation and ability to export queens to the USA

12

Other Achievements

- Participated in a virtual trade show SIAL Montreal
- Continued to expand and improve information in the Export Catalogue, listing beekeepers and companies interest in international honey sales.
- Many international trade shows scheduled for 2022

13

Thanks to the members of CAPA for their continuing support of the Canadian Honey Council and to the industry in general. Particular thanks to Dr. Hoover for her generous help and support.

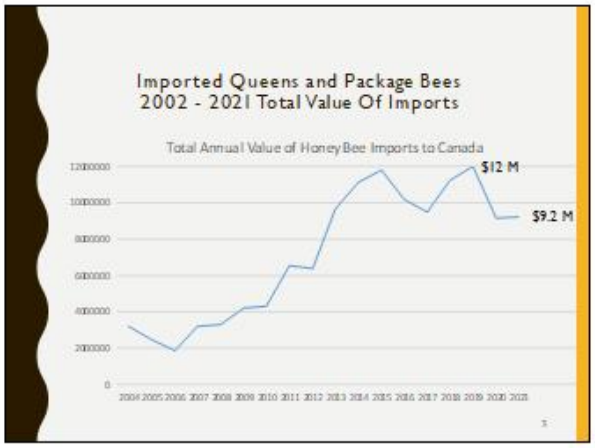
Willie Baumgartner Memorial Award for Outstanding contribution to the industry -

14

Appendix 2: AAFC Beekeeping and Honey – Production and Trade National Overview
Stephen Page

1

2



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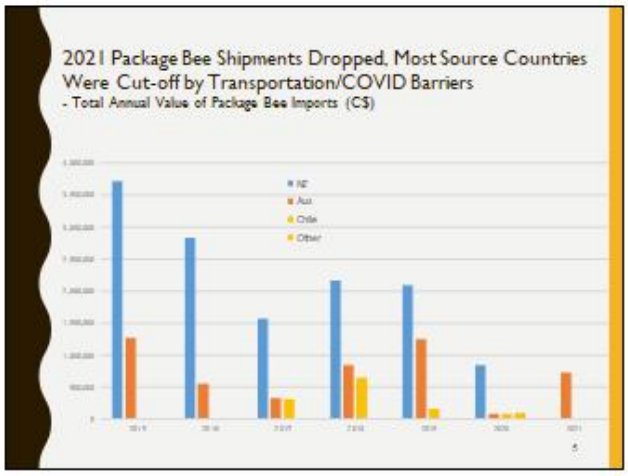
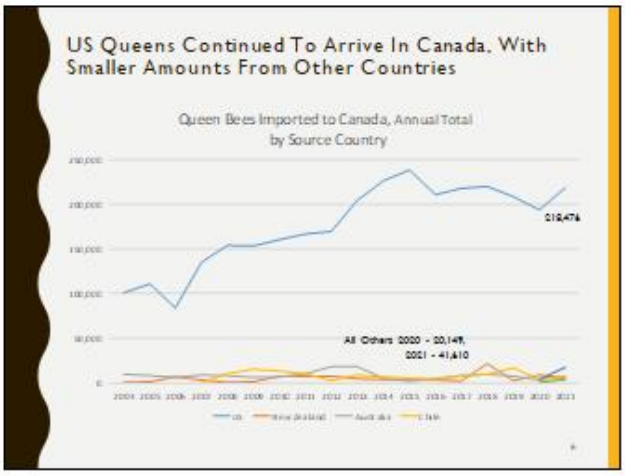

2021 Package Bee Shipments Dropped, Most Source Countries Were Cut-off by Transportation/COVID Barriers
- Total Annual Value of Package Bee Imports (C$)
NZ
Aus
Chile
Other
5

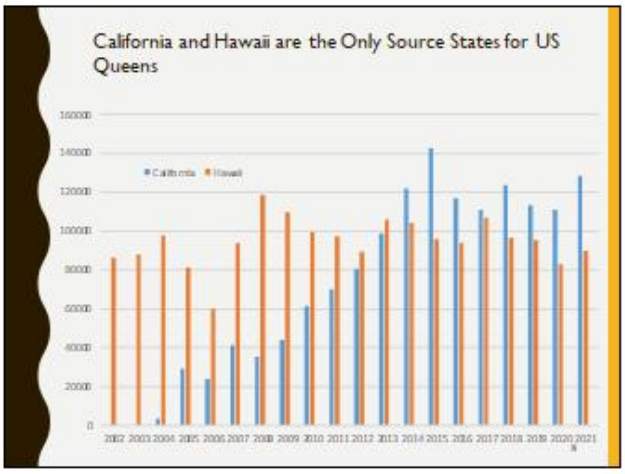
5


US Queens Continued To Arrive In Canada, With Smaller Amounts From Other Countries
Queen Bees Imported to Canada, Annual Total by Source Country
All Others 2020 - 20,149, 2021 - 41,610
6

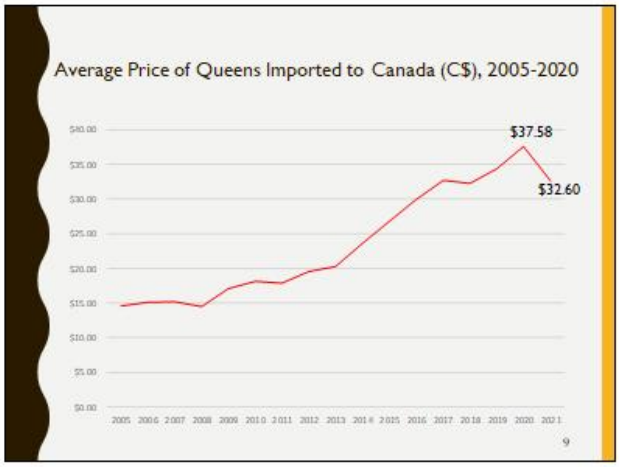
6


Total Quantity of Queens Imported to Canada (each), 2002-2021
260,041
7

7


California and Hawaii are the Only Source States for US Queens
California
Hawaii
8

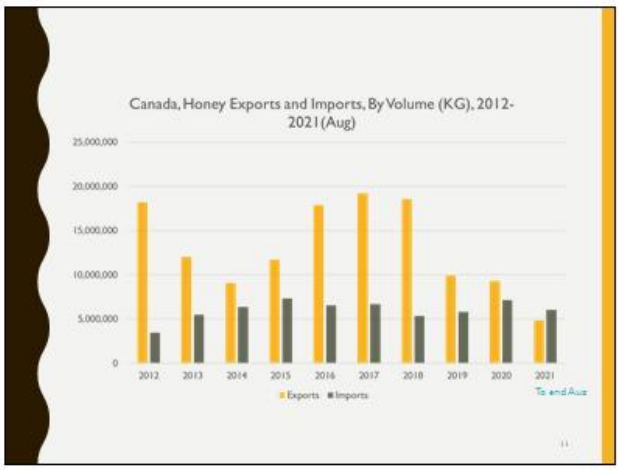
8


Average Price of Queens Imported to Canada (C$), 2005-2020
$37.58
$32.60
9

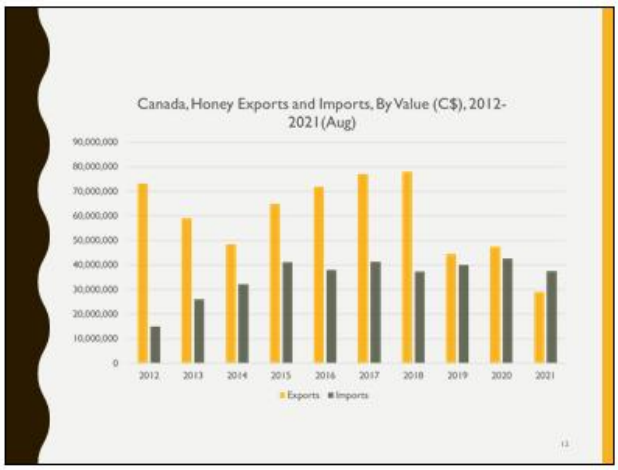
9


OUTLINE
-BEE IMPORTS
-HONEY TRADE
-HONEY PRODUCTION

10


Canada, Honey Exports and Imports, By Volume (KG), 2012-2021 (Aug)
Exports
Imports

11


Canada, Honey Exports and Imports, By Value (C$), 2012-2021 (Aug)
Exports
Imports

12

TOP EXPORT MARKETS FOR CANADIAN HONEY 2021 TO END AUG.

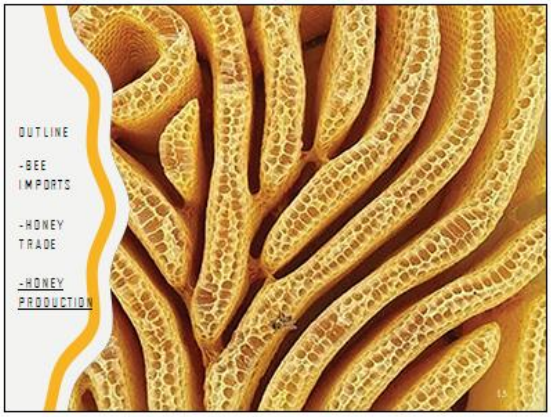
	Value in C$	Vol. in KG	Average Price per lb. to date
TOTAL	**28,984,705**	**4,844,944**	**$ 2.72**
Japan	18,676,074	3,062,092	$ 2.77
United States of America	8,533,536	1,482,081	$ 2.62
Korea, South	819,744	139,953	$ 2.66
China	344,782	60,743	$ 2.58
United Kingdom	165,966	24,233	$ 3.11
Hong Kong	117,556	16,356	$ 3.27
India	92,462	16,713	$ 2.51
Belgium	50,946	9,263	$ 2.50
Greece	46,925	10,648	$ 2.00
Kuwait	41,782	7,612	$ 2.49
United Arab Emirates	18,224	3,174	$ 2.61

13

TOP IMPORT SOURCES FOR HONEY TO CANADA 2021 TO END AUG.

	Value in C$	Vol. in KG	Average Price per lb. to date
TOTAL	**33,372,234**	**6,022,547**	**$ 2.52**
New Zealand	8,761,320	211,548	$ 18.83
Brazil	8,576,663	1,882,873	$ 2.07
India	2,454,769	865,181	$ 1.29
Spain	2,208,202	571,810	$ 1.76
United States of America	2,175,085	527,883	$ 1.87
Thailand	1,817,657	673,470	$ 1.23
Australia	1,564,079	133,014	$ 5.34
Saudi Arabia	1,371,226	174,223	$ 3.58
Greece	1,058,632	171,045	$ 2.81
Viet Nam	695,254	309,087	$ 1.02
Argentina	387,055	98,800	$ 1.78
Ukraine	307,681	104,247	$ 1.34
Turkey	302,662	39,301	$ 3.50
Russian Federation	243,638	69,793	$ 1.59
France	202,922	17,698	$ 5.21
Kuwait	139,861	10,246	$ 6.20
Cuba	107,092	36,023	$ 1.35
Germany	87,101	8,197	$ 4.83
Poland	84,838	12,298	$ 3.14
Italy	84,758	5,291	$ 7.28
Romania	76,769	7,122	$ 4.90
China	51,825	11,970	$ 1.97

14



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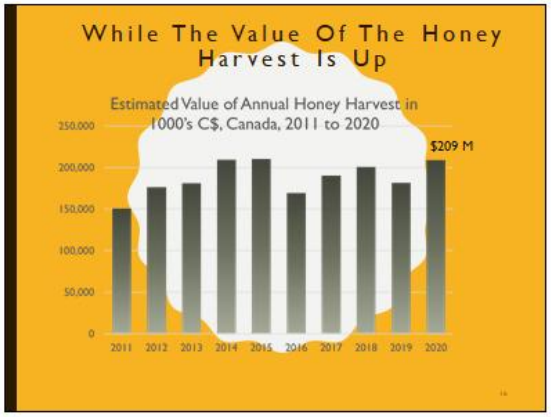

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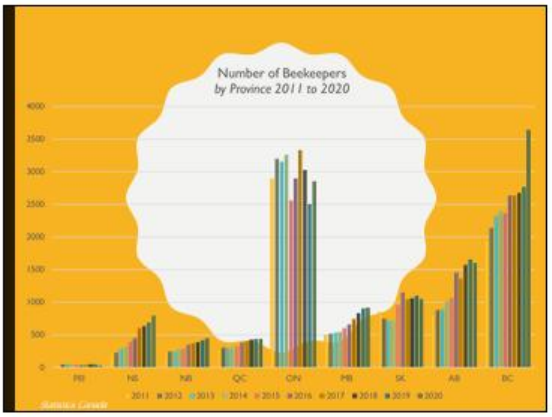
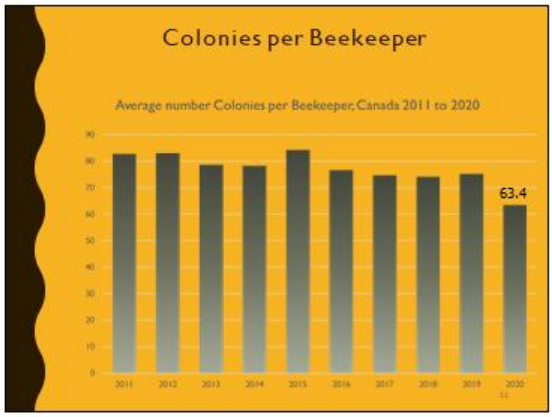
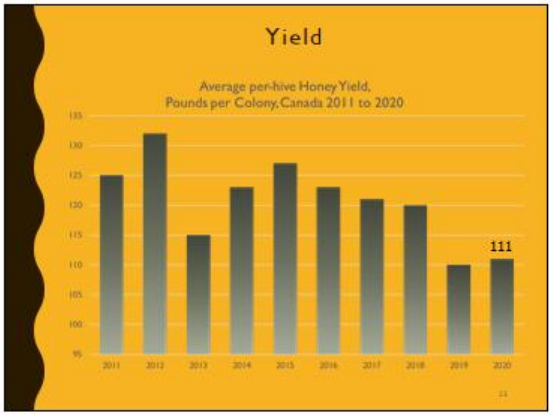

Number of Beekeepers
by Province 2011 to 2020

21


Colonies per Beekeeper
Average number Colonies per Beekeeper, Canada 2011 to 2020
63.4

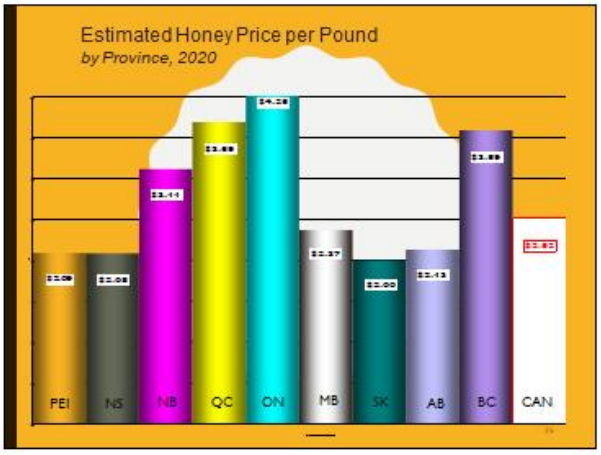
22


Yield
Average per-hive Honey Yield,
Pounds per Colony, Canada 2011 to 2020
111

23


Average Estimated Price per Pound, Honey
Canada 2011 to 2020

24



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THANKS

STEPHEN PAGE

SECTOR SPECIALIST

AGRICULTURE AND AGRI-FOOD CANADA

STEPHEN.PAGE@AGR.GC.CA

ALL DATA IS FROM:

1) STATISTICS CANADA ANNUAL BEE AND HONEY SURVEY (FOR AAFC)

2) MONTHLY TRADE STATISTICS (HARMONIZED SERIES) ACCESSED THROUGH CANADIAN AGRI-TRADE SYSTEM (CATS)

3) ON OCTOBER 5, STATISTICS CANADA LAUNCHED THE CANADIAN INTERNATIONAL MERCHANDISE TRADE (CIMT) WEB APPLICATION, WHICH WILL REPLACE THE EXISTING CIMT ONLINE DATABASE

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Appendix 3: CAPA – Core Winter Loss Survey Questions (2021)

The followings are the core questions that will be used in 2021 by each provincial apiarist for reporting the colony winter losses at the national level. As it has been since 2007, the objective is to estimate the winter kills with a simple and standardized method while taking into account the large diversity of situations around the country. This is a survey so these questions are to be answered by the beekeepers.

1. How many full sized colonies[4] were put into winter in fall 2020?

Outdoor wintering	Indoor wintering	Total

2. How many full sized colonies[1] survived the 2020/2021 winter and were considered viable[5] on May 1st (British Columbia), May 15th (Ontario, Quebec and Maritimes) or May 21st (Alberta, Manitoba, Newfoundland and Saskatchewan)?

Outdoor wintering	Indoor wintering	Total

3. Which method of treatment did you use for varroa control in **spring 2020**? What percent of hives were treated? *(Choose all that apply)*

	Treatment	Percent of hives treated (%)
☐	Apistan (fluvalinate)	
☐	CheckMite+ (coumaphos)	
☐	Apivar (amitraz)	
☐	Thymovar (thymol)	
☐	ApiLifeVar (Thymol and essential oils)	
☐	Bayvarol (flumethrin)	
☐	65% formic acid – 40 ml multiple application	
☐	65% formic acid – 250 ml single application	
☐	Mite Away Quick Strips (formic acid)	
☐	Formic Pro (formic acid)	
☐	Oxalic acid	

[4] Does not include nucleus colonies

[5] Viable : A viable colony, in a standard 10-frame hive, is defined has having 4 frames or more being 75% bee-covered on both sides.

NB: You must not include in this data new colonies created by division or purchased in spring 2021. You must however include overwintered colonies that would have been sold before May 1st (British Columbia), May 15th (Ontario, Quebec and Maritimes) or May 21st (Alberta, Manitoba, Newfoundland and Saskatchewan).

☐	Hopguard II (hop compounds)	
☐	Other *(please specify)* _____	
☐	None	

4. Which method of treatment did you use for varroa control in late **summer/fall 2020**? What percent of hives were treated? *(Choose all that apply)*

	Treatment	**Percent of hives treated (%)**
☐	Apistan (fluvalinate)	
☐	CheckMite+ (coumaphos)	
☐	Apivar (amitraz)	
☐	Bayvarol (flumethrin)	
☐	Thymovar (thymol)	
☐	ApiLifeVar (Thymol and essential oils)	
☐	65% formic acid – 40 ml multiple application	
☐	65% formic acid – 250 ml single application	
☐	Mite Away Quick Strips (formic acid)	
☐	Formic Pro (formic acid)	
☐	Oxalic acid	
☐	Hopguard II (hop compounds)	
☐	Other *(please specify)* _____	
☐	None	

5. Regarding **Varroa** monitoring:

a. Have you monitored your colonies for Varroa during the 2019 season?

○ Yes – sticky board

○ Yes – alcohol wash

○ Yes – other (*please specify*) _____

○ No

b. How often do you monitor your colonies with either sticky board or a washing technique (alcohol, powder sugar or gas)?

○ Just in the Spring

○ Just in the Fall

○ Both Spring and Fall

○ At least 3 times a year

6. Which method of treatment did you use for **nosema** control in **spring 2020**? What percent of hives were treated?

	Treatment	**Percent of hives treated (%)**
☐	Fumagillin	
☐	Other (*please specify*) _____ _____	
☐	None	

7. Which method of treatment did you use for **nosema** control in **fall 2020**? What percent of hives were treated?

	Treatment	**Percent of hives treated (%)**
☐	Fumagillin	
☐	Other (*please specify*) _____ _____	
☐	None	

8. Did you apply the following treatments for American or European **foulbrood** in **spring 2020**? What percent of hives were treated? *(Choose all that apply)*

	Treatment	**Percent of hives treated (%)**	
		AFB	**EFB**
☐	Oxytetracycline		
☐	Tylosin		
☐	Lincomycin		
☐	None		

9. Did you apply the following treatments for American or European **foulbrood** in **fall 2020**? What percent of hives were treated? *(Choose all that apply)*

	Treatment	**Percent of hives treated (%)**	
		AFB	**EFB**
☐	Oxytetracycline		
☐	Tylosin		
☐	Lincomycin		
☐	None		

10. To what do you attribute the main cause of death of your colonies? (Please check every suspected cause and rank the causes according to their relative importance.)

	Cause of death	**Rank (1 = the most important)**
☐	Don't know	
☐	Starvation	
☐	Poor queens	
☐	Ineffective Varroa control	
☐	Nosema	
☐	Weather	
☐	Weak colonies in the fall	
☐	Other (*Please specify*) _____	
☐	Other (*Please specify*) _____	
☐	Other (*Please specify*) _____	

11. On a scale of 1 to 10, how would you rate the impact of issues linked to the COVID-19 pandemic on your winter mortality?

a. If you answered 6 or more, please answer the following question:
What is the nature of the issues related to COVID-19 that had a significant impact on your winter mortality?

☐	The person/people looking after my hives, myself or a loved one became ill
☐	Access to supplies necessary for my beekeeping management (ex: syrup)
☐	Access to bees (queens, packets of bees, etc.)
☐	Access to labor (ex: temporary foreign worker)
☐	Movement restrictions (ex: between regions or provinces)
☐	Other: _____

List of Canada's Provincial Apiculturists

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Karen Kennedy M.Sc. (Agr.), P.Ag.
Fruit Crop Development Officer & Provincial Apiarist Department of Fisheries and Land Resources
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✉ KarenKennedy@gov.nl.ca

NOVA SCOTIA
Jason Sproule
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Nova Scotia Department of Agriculture
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QUÉBEC
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Ministère de l'Agriculture, des Pêcheries et de l'Alimentation
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Industry Development Specialist - Provincial Apiarist Manitoba Agriculture
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Acting Provincial Apiculturist
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NEW BRUNSWICK
Chris Maund
Integrated Pest Management Specialist (Entomologist) and Provincial Apiarist
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Crop Sector Development Hugh John Flemming Complex
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ONTARIO
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Ministry of Agriculture, Food and Rural Affairs Animal Health and Welfare Branch
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BRITISH COLUMBIA
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Appendix 4. CAPA Research Report

CAPA Research Report 2022
Projects reported by CAPA members – Nov 2021

Refining the Standard Bioassay Method for Detecting Resistance in Populations of Varroa Mites by Acute Toxicity

Date: September 5, 2021
Principal Investigator/Institution:

- Dr. Nuria Morfin-Ramirez - University of Guelph - Honeybee Research Centre
  - nmorfinr@uoguelph.ca
- Paul Kozak – Ontario Ministry of Agriculture, Food and Rural Affairs
  - paul.kozak@ontario.ca
- Colette Mesher – Ontario Beekeepers' Association, Technology Transfer Program
  - colette.mesher@ontariobee.com

Project Overview:

This project will determine if more direct methods of measuring toxicity of a common treatment for varroa mites (*Varroa destructor*) under laboratory settings can provide a more accurate assessment measuring efficacy in samples of varroa mites and lead to methods that may help define thresholds for resistance in populations of varroa mites.

Varroa mites will be collected from highly infested honey bee colonies in early fall. This is the time of the season when varroa mite levels peak and it is more likely that there will be adequate numbers required for experiments. The varroa mites will be inserted into vials and exposed to five standard dosages at different concentrations (90%, 75%, 50%, 25% and 0 %) of three acaricides (T-fluvalinate, amitraz, flumethrin) used in registered varroa treatment control products available to Ontario beekeepers.

This method will allow for:
• A better assessment of the point at which acaricides switch for a decrease in efficacy to the development of true resistance of product failure.
• Future opportunities for accredited / fee for service labs to offer this service
• Comparison between this refined method and the standard bioassays in the field
Funding requested (including HST): $3, 616+ $470.08 (HST) = $ 4, 086.08

Project title: Reduction of Winter Mortalities by an Early *Varroa destructor* Control During the Summer Period in Quebec Hives
Principle Investigator:
Name: Pascal Dubreuil
Address: College of Veterinary Medicine**,** St-Hyacinthe PQ, J2S 2M2
Email: pascal.dubreuil@umontreal.ca
Telephone: (450) 773-8521 poste 8266
Co-Investigators
Name: Marilène Paillard
Address: 120-A Chemin du Roy, Deschambault (Québec), GOA 1S0
Email: marilene.paillard@crsad.qc.ca
Telephone: (418) 286-3353 p. 249

Name(s): Pierre Giovenazzo
Address: Pavillon Vachon, 2325 Rue de l'Université, Québec City, QC G1V 0A6
Telephone: (418) 656-2131 poste 408081

Abstract (300 words or less):
The role of *V. destructor* (Vd) is crucial in winter hive losses in worldwide beekeeping operations. During the past 15 years, Canadian and Québec winter mortalities ranged from 15% to 35% and the control of Vd infestation levels during the honey season seems to be a major factor. The objectives of this research were: 1) to measure the effects of controlling the varroa threshold during the summer, on the zootechnical performances, health status, winter mortality and spring development of hives; 2) to evaluate the pathogenicity of *V. destructor* on bee colonies in relation to other pathogens. The project will be conducted over 3 consecutive years by evaluating different summer treatment approaches against Vd (year 1); by finding the best treatment period during the summer (year 2); and by transferring one approach to commercial beekeepers (year 3). During the first year, 50 colonies will be allotted to 5 different treatment groups applied in early August: 1- Control (without treatment), 2-VSH (without treatment, but with queens with high Varroa Sensitive Hygienic line) 3- formic acid (Mite Away Quick Strip) 4- oxalic acid (dripping) 5- oxalic acid (slow release in a glycerine matrix). In the second year, a similar protocol will be applied (50 colonies, 5 treatments) with the best approach obtained in year 1 but at modified application times: (1) July 1st; (2) August 1st; (3) July 1st and August 1st; (4) control; (5) VSH. For the third year, the two best approaches of the first 2 years will be retained and applied in 3 Québec zones among commercial beekeepers who will provide 2 apiaries of 24 colonies. This project should provide the information if whether or not maintaining varroa populations below a 5% threshold throughout the summer season and mainly in late summer and early fall will allow a better health status of the hive in early late summer and early fall resulting in better winter survival.

Start Date: May 2019
End Date: April 2022
Total Funding for Project: 208 000$
Funding Sources: Programme Innov'Action agroalimentaire Québec 2018-23 (MAPAQ) and Centre de recherche en sciences animales de Deschambault.

Stockage et hivernement des reines de l'abeille domestique (*Apis mellifera* L.)

Co-Investigators: Andrée Rousseau (research scientist, CRSAD)
Graduate student Laval University: Mireille Lévesque (2019-21)

Abstract: Queen breeders across Canada produce their earliest queens end of May when mature drones and first virgin queens are produced. But the Canadian beekeeping industry needs queens earlier, after wintering (end March-early April), to replace dead or failing queens / colonies. Consequently, our industry is highly dependent on queen imports (from California USA mainly) at the beginning of the season. The goal of our project is to maintain locally produced mated queens live and fertile from September to April. To accomplish this, various queen banking/storage methods will be tested (temperatures below or above cluster formation and queen density in banks). Efficacy of tested methods will be evaluated by measuring queen survival, sperm viability within queen's spermatheca and the post banking performance of queens introduced in colonies the following season. Hopefully, results from this project will allow beekeepers have access to locally raised queens early spring and thus reduce their dependency toward queen imports.

Start Date: 2019-04-01
End Date: 2022-03-31

Total Funding for Project: $228 000
Funding Sources: Innov'Action, Ministère de l'agriculture des pêcheries et de l'alimentation du Québec et Centre de recherche en sciences animales de Deschambault.

Genetic selection of honeybees in northern climates
Graduate student: Ségolène Maucourt PhD (2017-2021)

Abstract: This project aims at increasing self-sufficiency of the Canadian beekeeping industry. My research focuses on honey bee selection, to increase productivity and resistance to pathogens and parasites, with emphasis on the parasitic mite *Varroa destructor*. Major research objectives are to develop honey bee specific statistical models that will assign a genetic value to each colony based on heritability of selected traits and to study Varroa Sensitive Hygiene-VSH behavior and use it as a novel selection trait. Research will be accomplished through controlled experiments and colony assessments in CRSAD colonies. These experiments are grouped in 5 Activities: (Activity 1) Measures of various selection criteria CRSAD colonies; (Activity 2) Calculations of heritability values of selection criteria; (Activity 3) Development of a flexible selection index; (Activity 4) Comparison of marker assisted selection with phenotypic selection; (Activity 5) Fundamental knowledge of Varroa Sensitive Hygiene behavior.

Start Date: 2019-04-01
End Date: 2024-03-31
Total Funding for Project: $152 000
Funding Source : Conseil de recherches en sciences naturelles et génie Canada, Subventions à la découverte SD.

Project title: Emerging Threats to Pollinators

Principal Investigators:
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Co-Investigators and collaborators (including graduate students):
Names: Sophie Cardinal – AAFC, Leonard Foster- UBC, Ryan Schwarz - Fort Lewis College, Carlos Castillo and Patricia Wolf Viega - NBDC

Abstract or project description (300 words or less):
One of the factors implicated with declines in bee health and abundance is the presence of emerging parasites and pathogens including: the newly-introduced microsporidian *Nosema ceranae*, recently characterized trypanosomatids *Crithidia mellificae* and *Lotmaria passim*. There is limited information available on the prevalence of these organisms in bee species, the pathology they trigger and the molecular mechanisms involved in pathogenesis. Better characterized organisms such as *Crithidia bombi*, known to impair bumblebee health, also highlight the potential for pathogen spill-over from managed to native pollinators. Clearly there is a need to address the paucity of information on emerging disease threats in pollinator communities, and to determine their impact on pollinator health.

This project aims to investigate whether these parasites are widespread in managed and wild pollinator communities, which species are present, and how they affect pollinator health. A survey of honey bees and wild bees collected in different provinces followed by diagnostic testing will provide information on their prevalence in Canada. To address the question on their effect on pollinator health, we will perform controlled infection experiments of honey bees and evaluate molecular and proteomic markers of immune defence of bees, and survival. Infections are planned with the individual microsporidian and trypanosomatid parasites, and with combinations thereof, as we have found that co-infections are common in Canadian bee populations.

Start Date: April 1, 2016
End Date: March 31, 2022
Total Funding for Project: $200,252
Funding Sources: AAFC: $200,252, UBC in kind: $50,000

Project title: Blueberry Pollination and Bee Health

Principal Investigator:

Name: Marta Guarna - AAFC
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Co-Investigators and collaborators (including graduate students):

Names: Leonard Foster and Heather Higo - UBC, Steve Pernal - AAFC, Patricia Wolf Veiga - NBDC.

Abstract or project description (300 words or less):

Blueberries are Canada's top fruit export. In 2016, fresh and frozen blueberry exports were valued at over $400 million. Blueberries are cultivated in over 75,000 hectares that produce over 200,000 metric h tonnes of fruit. Canada's blueberries are grown in wild (lowbush) and cultivated (highbush) varieties, and most of Canada's cultivated blueberries are produced in British Columbia (BC) and are pollinated by honey bee colonies from BC and Alberta.

There is increasing concern amongst beekeepers that pollinating blueberries is harming the health of their bees and affecting later colony productivity. Beekeepers report poor colony health and increased frequency of European foulbrood (EFB) disease which can result in increased use of antibiotics. Antibiotics may leave residues on the hive and result in the removal of the colony for honey production.

Risk factors that affect health and productivity are not well defined but may include: nutritional deficiency to the characteristics of blueberry pollen combined with lack of supplemental foraging sources, and/or effects of in-hive and environmental chemicals, including agrochemicals. To understand these risk factors and test a potential management strategy, we will monitor colonies with and without nutritional supplementation (via protein patties) before and after they pollinate blueberries. Colonies will be inspected to determine their strength and to assess their disease status. Disease status will be evaluated by recording visual symptoms of disease and molecular analysis of pathogens and parasites, including EFB, AFB (American foulbrood), Nosema spp., and Varroa. Adult bees and pollen samples will also be collected for chemical analysis.

We aim to understand risk factors and finding management strategies to increase bee health during pollination. Increasing pollinator health will ensure that beekeepers continue to confidently offer colonies for pollination and that blueberry growers continue to benefit from the pollination services of managed honey bees to obtain high crop yields.

Start Date: April 1, 2018

End Date: March 31, 2022
Total Funding for Project: $180,000
Funding Sources: Cash: CBRF/CHC: $14,700, BCHPA: $30,000, BC Blueberry Council: $12,500, PAm: $30,000.
In kind: AAFC: $33,300, UBC: $7,000, NBDC: $15,000, Beekeepers: $37,500

Project title: Mass Storage of Honey Bee Queens overwinter

Principle Investigator: Renata Soares Borba, Alberta Beekeepers
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Co-Investigator: Shelley Hoover, University of Lethbridge
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Abstract (300 words or less): The highest demand for new queens from beekeepers in Alberta is in the early spring, at which time they are used to to replace older queens and head queenless colonies. However, due to our temperate climate, the domestic Canadian queen supply is unable to meet demand in early spring, as queen breeding in Canada does not start until May. Canadian beekeepers therefore import over 200,000 queens from the U.S.A., Chile, New Zealand and Australia. One tool to help achieve Canadian self-sufficiency in queen production would be storing summer-mated queens over the winter, and having them available early the following spring for beekeepers to establish new colonies or to re-queen existing units. Previous research from British Columbia, Ontario, and Quebec have developed methods to store large numbers of queens that would ultimately replace a good proportion of the queens that are imported each year in the spring. However, due to the different environments of these regions, this technology must be tested and adapted for use in Alberta. Our project will provide proof-of-concept that this technology can work in Alberta, evaluate the performance of different overwintering strategies, and disseminate this knowledge to the industry. The main questions this project will address are:
1 – Can we successfully store mated queens throughout the winter in Alberta for use in the early spring, using previous published methods by groups in different provinces? How do these methods need to be adapted for Alberta?
2 – Evaluate the performance of the innovation - Does long-term storage of mated queens over the winter affect queen's sperm viability and ultimately colony performance in the next season?

Start Date: 2020-08-01
End Date: 2023-03-31
Total Funding for Project**:** $127,238.00 Funding Sources**:** Canadian Agricultural Partnership, Alberta Agriculture and Forestry, University of Lethbridge, Alberta Beekeepers Commission, CBRF, Alberta Pollinators Fund.

Royal Treatment: Improving honey bee queen health as the basis of integrated colony health

Investigator: Shelley Hoover, University of Lethbridge
Department of Biological Sciences, University of Lethbridge (s.hoover@uleth.ca)
Co-investigators: Alison McAfee, Leonard Foster, University of British Columbia
Renata Soares Borba, Alberta Technology Transfer Team

Patricia Wolf Veiga, NBDC

Abstract
Honey bees (Apis mellifera) live in colonies headed by a single queen. This queen is the sole reproductive female, and the long-term survival of the colony depends on her ability to produce healthy offspring; queen health is therefore critical for colony success. Beekeepers in Alberta have faced very high levels of colony winter loss, 41% in the winter of 2019/20. Beekeepers in Alberta have also had difficulty accessing quality imported queens, and the COVID pandemic has highlighted the inherent risk in relying on imported stock. While many biotic (parasites, pathogens) and abiotic (weather, pesticides) stressors contribute to colony mortality, queen health has received surprisingly little attention. This is despite the fact that 'poor queens' are one of the most common reasons for winter loss by cited by beekeepers. We will therefore examine the linkages between queen health and colony success, and the factors that mediate these relationships. Specifically, the proposed project will examine methods of requeening and storing locally bred queens. This project will also examine the linkages between queen health and fecundity, queen pheromones, worker behaviours, and colony performance, providing beekeepers with on-farm methods by which they can evaluate queens before introducing them into colonies. Finally, we will provide beekeepers with specific queen management recommendations.

Start Date: 02/01/2021
End Date: 12/31/2024
Total Funding for Project: $496,513
Funding Sources: RDAR, Alberta Beekeepers Commission

Atlantic Tech Transfer Team for Apiculture (ATTTA)
Research Report for Canadian Association of Professional Apiculturists

Project title: Pollination in Wild Blueberry Fields

Principal Investigators:
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Abstract or project description:
ATTTA has conducted pollination research in wild blueberry fields from 2017 to 2019 in both New Brunswick and Nova Scotia. Several questions have been studied, including:

- The impact of honey bee stocking density on pollination success, berry mass, and yield
- The impact of honey bee stocking density on colony growth
- The impact of honey bee stocking density on abundance and diversity of bees in wild blueberry fields
- The effect of sending honey bee hives to blueberry pollination with pollen supplementation (covered in greater detail above)

A report on these research findings will be released in early 2020.
Questions that remain to be studied (until March 2023) include:

- The effect of moving honey bee hives during pollination
- The optimal timing (percent bloom) of placing honey bee hives in blueberry fields
- Best management practices for pollination of wild blueberry (BMP document will be completed once research has finished)

Start Date: May 2017
End Date: August 2023
Total Funding for Project: N/A Funding Sources**:** Atlantic Tech Transfer Team for Apiculture 4

Project title: Mass storage of honeybee queens during winter in Canada

Principle Investigator:

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Co-Investigators (including graduate students):

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Mireille Levesque, M.Sc. student, Université Laval

Abstract (300 words or less): The Canadian beekeeping industry requires an important number of honeybee queens in the spring of each year to replace winter mortality of colonies, for nucleus production and colony division. Canadian queen breeding industry cannot meet spring demand of queens because of limiting weathers conditions. Consequently, our industry is highly dependent on queen imports (from California USA mainly) at the beginning of the season. The goal of our project is to maintain locally produced mated queens live and fertile from September to April. To accomplish this, various queen banking/storage methods will be tested (temperatures below or above cluster formation and queen density in banks). Efficacy of tested methods will be evaluated by measuring queen survival, sperm viability within queen's spermatheca and the post banking performance of queens introduced in colonies the following season. Hopefully, results from this project will allow beekeepers to have access to locally raised queens early spring and thus reduce their dependency toward queen imports.
Start Date: July 2018
End Date: Mars 2022
Total Funding for Project: 296 909$
Funding Sources: Programme Innov'Action agroalimentaire 2018-2023 (MAPAQ), Centre de recherche en sciences animales de Deschambault, Université Laval, Canadian Bee Research Fund (Canadian Honey Council), Api Culture Hautes Laurentides, Les reines de la pollinisation.

Project title: Selective breeding for low and high *Varroa destructor* population growth in Ontario honey bee colonies

Principle Investigator:

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Co-Investigators (including graduate students):

Name: Paul H. Goodwin, Nuria Morfin, Paul Kelly, Alvaro De la Mora, Berna Emsen
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Telephone: Same as above

Name: Les Eccles, Daniel Borges
Address: Ontario Beekeepers Association

Abstract (300 words or less): One alternative strategy to reduce *Varroa destructor* infestations in honey bee colonies, is the development of *Varroa*-resistant honey bees. Therefore, a breeding program was initiated to select for lower and higher rates of *Varroa*-population growth (LVG and HVG, respectively) and deformed wing virus (DWV) levels, which is transmitted by the mites. After three years of bidirectional selection, LVG and HVG colonies varied significantly for *Varroa* population increases over the summer. Additionally, HVG colonies had higher mite infestation rates in adult bees compared to LVG colonies. DWV presence and levels were higher in HVG colonies than in LVG colonies. The results of this study thus far indicate that selection for LVG may result in colonies with lower *Varroa* infestation rates and lower prevalence and levels of DWV. We will select an additional generation of bees and incorporate instrumental insemination of queens to fix the presumed resistance traits. Future work will focus in determining mechanisms responsible for genetic differences and in identifying genes associated with *Varroa*-resistance in honey bees.

Start Date: April 2018
End Date: March 2022
Total Funding for Project: 240,000.00
Funding Sources: OMAFRA & Pinchin family grant

Project Title: Ecology and Species Status of the Giant Himalayan Honey Bee*, Apis laboriosa*
Principal Investigators:

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Abstract:
Apis laboriosa was described in 1871, following which it was considered to be a high elevation subspecies of the widely distributed species *Apis dorsata* for~ 80 years. Although many lines of evidence (e.g., morphometric, morphological, characters, genetic, and behavioural [timing of mating flights]) support the uniqueness of *Apis laboriosa* as a species, some systematists (e.g., M. Engel, 1999) continue to consider this taxon to be a subspecies.
Our research should settle the question of the species status of *Apis laboriosa*:
1) *Co-occurrence at sites in NE India*. N. Kitnya has discovered 5 sites in 3 regions of Arunachal Pradesh where *Apis laboriosa* (golden thoracic hairs, black abdomen) forages sympatrically with *Apis dorsata* (black thoracic hairs, orange-brown anterior abdominal segments). Morphometric analyses of specimens separate them into two non-overlapping clusters. Ocellar structures on the head differ significantly. These results suggest that these two taxa do not hybridize (and by the biological species concept qualify as separate species).
2) *Distribution.* Through our fieldwork and collaboration with researchers from Nepal, Bhutan, and Vietnam, we have extended the distribution of *Apis laboriosa* further to the northwest in Uttarakhand, India; to the east in Vietnam; southward in the Arakan Mountains to west central Myanmar; and to the Shillong Plateau of Meghalaya, India. Published in 2020:
Kitnya et al. (2020) Geographical distribution of the giant honey bee Smith 1871 (Hymeolptara: Apidae). *ZooKeys* 951: 67-81:
(https://zookeys.pensoft.net/article/49855/https://zookeys.pensoft.net/article/49855/
3) *Timing of mating flights.* To be studied in 2020.
4) *Seasonal migration.* Both *A. dorsata* and *A. laboriosa* move to low elevations for the winter, then migrate up river valleys towards Tibet. Ongoing studies, 2019-2021.
5) *Taxonomy of* Megapis. We have collated specimens of workers and drones from throughout the range of all 4 subspecies/species of giant honeybees in order to create a key to discriminate them into 2-4 species.
6) *Genetics.* Genetic analyses of *Megapis* specimens will help to determine their distinctiveness and approximate time of separation.

Start Date: January 2018
End Date: December 2022
Funding: Unknown (Indian funding sources)
Gard Otis uses his personal funds to participate in fieldwork and meetings

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Project title: **Mechanistic studies of disease resistance in honey bees**

Principal Investigator:
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Abstract or project description (300 words or less):
Honey bees are a crucial part of Canadian agriculture, contributing at least $4.6 billion/y: they produce between eighty and ninety thousand tonnes of honey each year and their pollination activities directly support the production of many fruits, nuts and vegetable crops. But the health of honey bees has been declining over the past decade, with Canadian beekeepers losing more than a quarter of their colonies each winter since 200607. In Canada, most of the winter losses of bees are attributed to known causes: a parasitic mite, fungal infections and weather. Bees have an innate immune system but it is ineffective against mites and the fungal pathogen has developed a way to avoid it. Thus, beekeepers are forced to use chemicals to control various infectious diseases, including the mite and fungi mentioned, but this is not always effective and is in any case undesirable. Some bees have a secret weapon though, social behaviours that enable them to fight off, or at least live with, pests and pathogens that would otherwise kill them. One of these mechanisms is called hygienic behaviour and our group has previously identified a potential explanation for how this behaviour can happen. It appears as if hygienic bees are better equipped to sense diseased or dying nestmates and remove them from the colony before the disease spreads. In the work proposed here we will work to understand the molecular processes at work in hygienic behaviour. This will, in turn, feed back into a parallel effort we are involved in that could see the realworld application of these findings into a selective breeding program that aims to strengthen the gene pool of Canadian bees so that they can naturally resist disease without beekeepers having to treat them with synthetic chemicals

Start Date: April 1, 2016
End Date: March 30, 2022
Total Funding for Project: $300,000 (over 6 years)
Funding Sources: NSERC DG

Project title: **BeeCSI: 'omic tools for assessing bee health**

Principal Investigators:

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Collaborators: Dr. Miriam Bixby (Univ. of British Columbia), Dr. Robert Currie (Univ. of Manitoba), Dr. Pierre Giovenazzo (Centre de recherche en sciences animales de Deschambault), Dr. Marta Guarna (AAFC and Univ. of British Columbia), Dr. Shelley Hoover (Univ. of Lethbridge), Dr. Stephen Pernal (AAFC), Dr. Jane Heffernan (York University), Dr. Ernesto Guzman (Univ. of Guelph), Dr. Sumeet Gulati (Univ. of British Columbia), Dr. Matt Betti (Mt. Alison Univ.), Dr. Rodrigo Ortega (AAFC), Dr. Ida Conflitti (York Univ., Dr. Sapna Sharma (York Univ.), Patricia Wolf Vega (National Bee Diagnostic Centre), Paul Van Westendorp (Province of BC), Dr. Jason Rogalski (Univ. of BC), Paul Kozak (Province of ON), Julie Ferland (Province of QC)

Abstract: Left unchecked, declines in honey bee health will threaten a $5.5 billion/y sector of Canada's agroeconomy,[1] which depends on bees for pollination (e.g. hybrid canola seed, most tree fruit crops, berries

and cucurbits). While pests, pathogens, exposure to agrochemicals and malnutrition can all impact bee health, it is often difficult to identify what key factors might be stressing a given apiary. Beekeepers and government regulators need to know the exact identity and combinations of stressors impacting specific populations before they can undertake appropriate management and regulatory changes to improve bee health.

Unfortunately, it is very difficult to rapidly identify the different stressors impacting the health of honey bee colonies. Currently, the industry relies on post-mortem analysis to test for the presence of a few known pathogens or toxins in dead colonies. With Canadian beekeepers losing 26% of their colonies every winter, in addition to other crop-associated losses in spring and summer, the industry is in dire need of modern tools to rapidly assess bee health in living colonies to allow for loss-mitigating strategies to be implemented. Our opportunity here is to ***deliver***:

a) A pioneering health assessment and diagnosis platform powered by stressor-specific markers enabled by expression and microbiome profiling.

b) Guidelines and education resources for using the diagnostic tool to manage honey bee health.

We have an integrated network of end-users who will be involved in the project, including Canadian beekeepers and bee breeders, the Canadian Association of Professional Apiculturists, provincial beekeeping associations and their technology transfer teams, diagnostic labs, as well as federal and provincial regulatory entities. This will allow us to realize the following ***benefits*** starting by the end of the project:

a) Ensure growth and sustainability of beekeeping, with a large economic impact (at least $160 M/y) realized through costs savings, mitigated risk, increased pollination and increased income.

b) Reduce conflict among beekeepers and farmers, and allow evidence-based policy setting by government regulators.

c) Healthier ecosystems for native pollinators and other wildlife by reducing cross-species pathogen transmission and unnecessary agrochemical residues in the environment.

To achieve these deliverables and benefits, we will build on our previous successes in conducting and translating large-scale honey bee 'omics research. We will measure stressor-induced changes in the transcriptome, proteome and microbiome to identify diagnostic markers. We will use data from our study to create a software platform that will provide rapid bee health assessments and suggest the most effective management strategies that can be applied by beekeepers in the field. We will capitalize on our strong relationships with a network of end-users for knowledge transfer and mobilization to ensure maximum uptake of deliverables. Our GE^{3}LS research will be integral to guiding 'omics research and ensuring *BeeCSI's* deliverables are ultimately translated. Our team has a strong track record in developing 'omic tools to improve bee health and has all the required expertise to develop this internationally-leading solution to bee health diagnostics.

Start Date: October 2019
End Date: September 2023
Total Funding for Project: $9,922,053
Funding Sources: Genome Canada, Genome BC, Genome Quebec, Ontario Genomics, UBC, York University, Agriculture and AgriFood Canada GRDI program (Pernal & Guarna, co-leads for AAFC GRDI)

Project title: 20/20 Bee Vectoring Project

Lead Investigator:
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Abstract (300 words or less):
Bee-vectoring, the precision delivery of bio-control agents to flowers by managed bees as they pollinate crops, offers an exciting opportunity to satisfy consumer demand for reduced pesticide use while sustainably intensifying strawberry production. Proof-of-concept is established, but uptake has been hindered by regulatory and educational obstacles which can be overcome through a strong inter-disciplinary collaboration. Our project is a collaboration among researchers at the University of Guelph, 2 companies that produce biocontrol agents, an advisor on pest-control regulations at the Ontario Ministry of Agriculture, Food, and Rural Affairs, and three farm organizations that represent berry growers (Berry Growers of Ontario), ecological farmers (Ecological Farmers of Ontario), and organic farmers (Canadian Organic Growers). The project's main objective is to make ecologically sound alternatives for controlling diseases and pests in strawberry available to growers by (1) supporting availability of more biocontrol agent options for the crop and (2) increasing uptake by strawberry growers of bee vectoring. We will achieve our objective by doing the research to fill knowledge gaps that prevent the full registration and labelling of biocontrol agents for bee vectoring on field strawberries. Using information from our research we will provide an economic analysis of the system for growers, outlining costs and benefits. Finally, through our farm organization collaborators, we will inform growers in plain language about the findings of our research in a variety of grower-oriented ways. As a result of the project, we anticipate the increased availability of biocontrol agents for use in strawberry and an increase in uptake by growers of bee vectoring of biocontrol agents to strawberry.

Start Date: January 01, 2020
End Date: December 31, 2022
Total Funding for Project: 237,000
Funding Sources: George Weston Ltd. Seed Food Innovation

Project Title: Field Trials of a New Acaricidal Compound Against Varroa destructor in Honey Bee Colonies

Principal Investigators:
Name: Steve Pernal - AAFC, Erika Plettner - SFU
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Telephone: 780-518-5001

Co-Investigators and collaborators (including graduate students):
Names: Robert Lu – University of Alberta (Graduate Student)

Abstract or project description (300 words or less):
We have discovered a new compound with strong acaricidal activity against *Varroa destructor*, having no toxicity towards bees or vertebrate animals as well as no detectable effects in the Ames test, a standard biological assay used to assess the mutagenicity of chemical compounds. Following an initial full-scale field trial in 2019 which had very promising results, we plan to field test this compound in fall and spring applications from 2021 – 2024 in northern Alberta and the lower mainland of BC. We will also perform analyses of the new compound's residues in wax and honey.

Start Date: Sept 7, 2021
End Date: March 31, 2024
Total Funding for Project: $249,500

Funding Sources: Project Apis m $200,000; Alberta Beekeepers Commission $40,000; Bee Maid Honey $3,500; CBRF: 6,000

Project title: Integrated Management of Varroa and its Interacting Stressors to Enhance Winter Survival of Honey Bees.

Principal Investigator:
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Collaborators (co-pi's): Charu Sharma M.Sc. student,

Abstract or project description (300 words or less):

Our project has three targeted goals designed to improve the management of the honey bee parasite Varroa destructor and its associated pathogens in order to improve winter survival of honey bees. First, is to optimize the ventilation of honey bee colonies during indoor winter storage to maximize bee survival and manage varroa mite populations. Second, is to examine the impact of early and late fall oxalic acid treatment of varroa on the development and health of "winter bees" and to investigate the best combinations of oxalic acid treatments to improve the reliability of control and wintering success in indoor and in outdoor environments. Finally, we will combine the results of the best ventilation and oxalic treatments to develop best practice recommendations for management of varroa.

AIM 1: Our lab has lead the world in the study of the potential for the use of modified atmospheres in winter storage to both enhance honey bee colony survival and control parasites and pathogens within bee hives. Using this technique, beekeepers could achieve some mite population reduction in their hives at little to no cost by turning off their ventilation fans using an automated control. This project will build upon previous research in our lab (Underwood and Currie; Kozak and Currie; Bahreini and Currie) that have demonstrated the impact of restricted ventilation during winter; storage on varroa mite survival. In both laboratory cage studies and tests on small colonies in chambers we have shown that restricting ventilation causes room levels of CO2 to reach 2% and that in-hive levels can reach as high as 4% resulting in increased mite mortality without harming bees. We recently extended these experiments to full size colonies with in experimental rooms containing 21 colonies but found that at although we could increase room CO2 and increase varroa mortality relative to hives under standard ventilation it is difficult to obtain and maintain high levels of CO2 strictly through restricted ventilation (Currie, unpublished). The objective of the first aim will be to determine the optimal levels and timing of CO2, O2 AND RH, to maximize the rates of varroa mite mortality in colonies while maximizing honey bee survival. Furthermore, we will investigate the potential to increase wintering building CO2 levels using techniques similar to those developed for control of stored products pests and to enhance plant growth in greenhouses (e.g. sublimation of dry ice and co2 generators).

AIM2: Oxalic acid effectiveness against mites is limited to broodless periods where efficacy can still be highly variable. Although early fall applications of this product (Currie, unpublished) do not kill varroa, they can improve honey bee survival without killing mites. In contrast early Amitraz treatment under high mite loads can kill mites but be harmful to bees. This implies that oxalic acid may act to prevent mites from feeding on

and damaging developing winter populations of bees, or that it somehow disrupts the interaction between bees and their associated viruses that harm developing winter populations of bees. The potential for using early fall oxalic treatment in integrated management of mites needs to be clarified. Furthermore, although the correct dosage for some formulations of oxalic is well known, the effects of number and timing of treatments using different application methods (trickle vs sublimation) on the reliability of treatment efficacy against varroa and impacts on colony health need further study.
AIM3: Once optimal wintering building ventilation and oxalic acid application methods are determined under AIM1 and AIM2, we will examine the most effective combinations of winter ventilation, oxalic acid and traditional acaricide treatments and compare their effectiveness and reliability of treatments under indoor and outdoor wintering to develop best practice recommendations for integrated pest management of varroa in Manitoba.

Start Date: April 1, 2020
End Date: March, 2023
Total Funding for Project: 463,190
Funding Sources:
Manitoba Agriculutre Canadian Agricultural Partnership CAP, Manitoba Beekeepers Association, Bee Maid, University of Manitoba

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Project title: Sensor Development and System Intelligence for Smart Hive and Apiary Management
Principal Investigator:
Name: Rob Currie, PhD,
Address: Dept of Entomology, University of Manitoba, R3T 2N2
Email: rob.currie@umanitoba.ca
Telephone: 204 - 474-6020
Collaborators (co-pi's): Charu Sharma M.Sc. student,

Abstract or project description (300 words or less):

Honeybees play a significant role in the Canadian economy for pollinating crops, producing valuable honey and medicinal products, and they also help sustain the natural lifecycle. One third of our food comes from the crops and vegetables produced by pollination with the help of bees, and one of the main crops requiring honeybee pollination is canola. Around the world, honeybees are facing significant challenges, and this has led to increased costs of production for food products. Major pressures include extreme weather, agricultural chemicals, reduced crop diversity, varroa mites and pathogens. A significant challenge and cost for the commercial apiary industry is that many hives are located in remote rural locations. This research project will develop technologies for the long distance monitoring and management of apiaries. The proposed research is unique from other international efforts. Smart Frames are a main focus, which will enable the monitoring of hive conditions at specific locations within hive boxes, such as honey production, bee activity, and temperature. They will also offer the ability to control temperature locally on each frame. Local targeted thermal control will be explored to supplement regulation of hive temperature, and as a method of varroa mite control that is less disruptive to colony growth and development, and less labour intensive than existing

methods. An intelligent software platform will be developed that will incorporate and analyze hive sensor data.
The technologies developed in this CRD research project will enable a leading platform for the remote interaction and automated management of apiaries. This platform represents a strategic technology effort for both of our industry partners Function Four and Durston Honey Farms, who will collaborate closely on the technology development and its application in a commercial apiary. The potential for significant economic benefit (both in manpower and time) to apiarists is apparent, enabled by reducing the need for physical inspection and management of hives, and potential improved health of apiaries.

Start Date: April 1, 2020
End Date: March, 2023
Total Funding for Project: 463,190
Funding Sources:
NSERC, Function Four, Durston Honey Farms Ltd

Project title: **BeeBiome Data Portal**

Principal Investigators:

Name: Rodrigo Ortega Polo (Agriculture and Agri-Food Canada)
Name: Marc Robinson-Rechavi (University of Lausanne and Swiss Institute of Bioinformatics)

Collaborators and end-users: The Bee Microbiome Consortium (http://beebiome.org/), Marta Guarna (AAFC), Dr. Shelley Hoover (Univ. of Lethbridge), Amro Zayed (York University), Patricia Wolf Vega (National Bee Diagnostic Centre), Renata Borba (Alberta Beekeepers Commission), Benjamin Dainat (Swiss Bee Research Centre, Agroscope), Philipp Engel (University of Lausanne), Vincent Doublet (University of Ulm), Jacques Dainat (National Bioinformatics Infrastructure Sweden).

Abstract:

Bees are fundamental to Alberta's agriculture, but are suffering severe declines worldwide caused by the interaction of multiple factors. The bee gut microbiome is the complex community of microorganisms living within the bee digestive system and it directly impacts bee health and immunity. The recent advent of sequencing technologies has enabled the generation of a large amount of bee microbiome data from different sources. There is an urgent need for those bee microbiome datasets to be made more accessible so that information can be applied for scientific discoveries and can be translated for stakeholder use.

The goal of this project is to advance the development of the BeeBiome Data Portal, which was initiated by the international Bee Microbiome consortium (http://beebiome.org/). The portal will maximize the value of the complex and diverse bee microbiome datasets by enabling analysis and dissemination of information on the microorganisms and viruses associated with bees. The objectives of the project are to include the following capabilities in the BeeBiome Data Portal:

1. Provide a procedure to upload new bee microbiome datasets by including standardised

information about the samples and datasets (i.e. standardised metadata) and allow for cross-study analysis.
2. Provide a comprehensive catalogue of all currently available sequence datasets about bee-associated microbes and viruses.
3. Serve as an entry point for assessing data and offer simple tools for data mining and visualisation to facilitate access to information on the diversity of bee-associated microbes and viruses and their impact on bee health.

The main deliverable of this project will be a portal that will catalyze bee microbiome research in Alberta and globally by promoting metadata standardization, sharing, analysis, and drawing conclusions from datasets to better understand the impact of associated microbes and viruses on bees. The outcome of the project will be an increased accessibility to bee microbiome data and its use for new scientific discoveries and for translation efforts. This increased accessibility will benefit the scientific community, stakeholders and policy makers by enabling data-driven approaches through bioinformatics for decision making regarding bee health.

Start Date: October 2021
End Date: March 2022
Total Funding for Project: $371,788 total budget of which $149,500 funded by Genome Alberta.
Funding Sources: Genome Alberta, Alberta Innovates, Agriculture and Agri-Food Canada, University of Lausanne, Swiss Bee Research Centre (Agroscope).

Appendix 5: CAPA Bylaws

CANADIAN ASSOCIATION OF PROFESSIONAL APICULTURISTS L'ASSOCIATION CANADIENNE DE PROFESSIONELS DE L'APICULTURE
BYLAWS

Objectives of the Association

1. To promote, develop and maintain good fellowship and cooperation among professional apiculturists (individuals whose work in government, university, or similar professional capacity involve managed bee species)
2. To create a meeting of administrative and research professionals for the purpose of discussing common interests related to bee management and effectively coordinating, where possible, their activities.
3. To aid in the dissemination of information regarding the beekeeping industry in all its forms.
4. To maintain a consultative rapport with the Canadian Honey Council and other organizations concerned with managed bee species.
5. To maintain a rapport with professional in apiculture and related fields in other countries.

ARTICLE I - Membership

I (1): Full membership, with voting privileges is open to personnel employed by Canadian Federal and Provincial governments, universities or college, and consultants who are employed in the field of apiculture or other related fields as:

- Federal apiculturist
- Provincial apiculturist
- Full-time or part time extension apiculturist
- Full-time or part time teaching and/or research apiculturist
- Full-time or part-time apiary inspectors or bee disease / pest inspection staff
- Full-time or part-time apicultural technicians or technicians associated with personnel or projects involving managed bee species
- Full-time or part time professionals in any other capacity whose work involves managed bee Species

I (2): Non-voting, associate membership in the association may, upon receipt of application, be granted to persons who are:

- Part or full-time graduate students involved in projects involving managed bee species
- Seasonal and / or casual apicultural technicians or technicians associated with personnel or projects involving managed bee species
- Seasonal and / or casual apiary or bee disease / pest inspection staff
- Representatives of appropriate programs within federal government agencies such as Agriculture and Agri-Food Canada, the Canadian Food Inspection Agency and the Pest Management Regulatory Agency
- The representative of the Canadian Honey council and a representative of any other organizations concerned with managed bee species.
- Members of the American Association of Professional Apiculturists
- Members of the Apiary Inspectors of America.

I (3): Membership or associate membership may be extended to persons other than those defined in Clauses I and II upon ratification by a majority of the membership

I (4): The privileges of membership in the Association shall terminate when a current member resigns or retires from the position which established his/her eligibility.

I (5): Membership fees shall be prescribed by the members in general meeting. The annual membership fee shall be payable in advance of the calendar year for which membership is requested. If an initial application for membership in the association is received by the Secretary at any time during the calendar year for which membership is requested, then payment in full of the annual membership fee shall be required in order for members to be active members of the association. The annual membership fee is non-refundable.

I (6): Every member shall receive a copy of the bylaws annually.

I (7): Privileges of membership shall be restricted to those holding current membership in good standing.

I (8) All members are in good standing except members who have failed to pay their current annual membership fee or any other subscription or debt due and owing by them to the Association, and the membership is not considered in good standing so long as the debt remains unpaid.

I (9) A Member whose annual fees are two years in arrears automatically loses membership in the Association.

I.(10): The decision to grant life memberships, honorary memberships, and awards of merit shall be made by a 75% majority of the members present at the general meeting.

ARTICLE II - General Meeting

II.(1): The annual meeting shall be held in person and/or virtually at a time and place designated by the executive.

II (2): The secretary shall send all members a notice of a general meeting sixty (60) days in advance of the date of such a meeting unless a majority of the members waive the sixty day requirement.

II (3): A quorum of a duly called general meeting shall be ten (10) full members in good standing.

II (4): Attendance at the Association's meeting shall be limited to members in good standing and guests invited by the executive.

II.(5): Minutes of the general meeting shall, when printed, be of a confidential nature and permission to use the information presented must be obtained from the executive.

ARTICLE III - Finances

III.(1): The fiscal year of the Association shall be from January 01 to December 31 of the calendar year.

III (2): All monies and securities held by the Association shall be in the name of the Canadian Association of Professional Apiculturists.

III.(3): All money transactions made by the Association shall be made by cheque signed by the Treasurer and the President.

III(4): If required, a member of the executive (Vice-President, Secretary, or Past-President) will be chosen to act as Designate by the executive to have signing authority on behalf of the President.

ARTICLE IV - Officers of the Association

IV(1): The full members in good standing shall, at the general meeting, through personal attendance or virtual attendance via electronic means (e.g. telephone, video conferencing), elect a President, Vice-President, Secretary, and Treasurer and appoint the Past-President into the executive. The executive may in turn appoint other officers and committee members as may be required.

(2): All officers shall be elected for a two year term of office and no officer shall serve more than two consecutive terms in the same office position. In case any executive position becomes vacant before the end of its two year term, an active member will be elected during the upcoming annual general meeting to fill this position for the rest of term of the vacant position. In the case of the elected interim person is elected in the future for another office, this person will be eligible to serve for no more than two consecutive terms.
IV (3): The president shall preside over all meetings of the Association and shall be ex-officio, a member of all committees.
IV (4): The vice-president shall perform the duties of the president in his/her absence or inability to act.
IV (5): The secretary shall:
1. Record the minutes of all meetings of the Association and distribute copies of these minutes to the membership sometime during the sixty (60) days following a meeting, and,
2. Send information and notices of motions and meetings etc. to the membership as required, and,
3. Maintain an up-to-date membership list, and,
4. Make arrangements to hold an annual general meeting, and other Association business. IV (6): The Treasurer shall:
1. Look after all financial matters (including collection of annual fees from each member) of the Association and maintain accurate financial records.
IV (6): The Past-President shall be that person who has most recently completed a term of Association President. Should the offices of the President and Vice-President both become vacant, the Past- President shall fill the office of President until an election can be held.

ARTICLE V - Amendments of Bylaws
V(1): Bylaws may be amended only by a recognized quorum at a general meeting and all members must be notified by the secretary of any proposed changes in the thirty (30) days in advance of the meeting date.

The foregoing are the Bylaws of the Canadian Association of Professional Apiculturists as amended at an annual general meeting held in Saskatoon Saskatchewan, at the Radisson Hotel, December 1 2015.

Appendix 6: CAPA Membership list

First name	Last Name	Member	City	Province
Abdullah	Ibrahim	Full	Beaverlodge	Alberta
Abigail	Chapman	Associate	Vancouver	British Columbia
Alexandra	Panasiuk	Full	Spruce Grove	Alberta
Alexandra	Sebastien	Associate	Vancouver	British Columbia
Alison	McAfee	Full	Vancouver	British Columbia
Alvaro	de la Mora Pena	Associate	Guelph	Ontario
Amanda	Gregoris	Full	Beaverlodge	Alberta
Amro	Zayed	Full	Toronto	Ontario
Andrée	Rousseau	Full	Deschambault	Quebec
Andrew	Byers	Full	Tatamagouche	Nova Scotia
Andrew	Pitek	Full	HILLSBURGH	Ontario
Cameron	Menzies	Full	Charlottetown	Prince Edward Island
Cassandra	Docherty	Full	Edmonton	Alberta
Chris	Jordan	Honourary		PEI
Christopher	Maund	Full	Fredericton	New Brunswick
Claude	Boucher	Honourary	St-Georges	Quebec
Clement	Kent	Full	Toronto	Ontario
Colby	Klein	Associate	Langley	British Columbia
Colette	Mesher	Full	Guelph	Ontario
Courtney	MacInnis	Associate	Edmonton	Alberta
Cynthia	Scott-Dupree	Full	Guelph	Ontario
Daniel	Borges	Full	Kitchener	Ontario
Daryl	Wright	Full	Winnipeg	Manitoba
David	Macdonald	Full	Salt Spring Island	British Columbia
Derek	Micholson	Full	Winnipeg	Manitoba
Diane	Dunaway	Full	Williams Lake	British Columbia
Don	Dixon	Honourary	Narol	Manitoba
Don	Gray	Honourary	Portland	Ontario
Don	Nelson	Honourary	Beaverlodge	Alberta
Doug	McCutcheon	Honourary	Armstrong	British Columbia
Doug	McRory	Honourary	Guelph	Ontario
Elemir	Simko	Full	Saskatoon	Saskatchewan
Elena	Battle	Full	Wembley	Alberta
Émile	Houle	Full	Deschambault	Quebec
Emily	Olson	Full	Edmonton	Alberta
Erika	Plettner	Full	Burnaby	British Columbia
Ernesto	Guzman	Full	Guelph	Ontario
Fletcher	Colpitts	Full	Glenvale	New Brunswick
Gabrielle	Claing	Full	Saint-Hyacinthe	Quebec

Gail	MacInnins	Full	Beaverlodge	Alberta
Gard	Otis	Honourary	Guelph	Ontario
Georges	Martin	Full	Deschambault	Quebec
Glenys	Robinson	Full	Richmond Hill	Ontario
Graham	Parsons	Full	Prince Albert	Saskatchewan
Graham	Thompson	Full	London	Ontario
Hanan	Gashout	Associate	Kitchener	Ontario
Heather	Clay	Honourary	Vernon	British Columbia
Heather	Higo	Full	Vancouver	British Columbia
Ida	Conflitti	Full	Toronto	Ontario
Ivanna	Kozzi	Associate	Saskatoon	Saskatchewan
Janet	Tam	Full	Guelph	Ontario
Jason	Sproule	Full	Truro	Nova Scotia
Jeff	Kearns	Full	Lethbridge	Alberta
Jenna	Thebeau	Associate	Langham	Saskatchewan
Joanne	Moran	Honourary		Nova Scotia
John	Gates	Honourary	Armstrong	British Columbia
Julia	Common	Full	Delta	British Columbia
Julie	Ferland	Full	Québec	Quebec
Karen	Kennedy	Full	Corner Brook	Newfoundland
Kelsey	Ducsharm	Full	Guelph	Ontario
Kenn	Tuckey	Honourary	Edmonton	Alberta
Kerry	Clark	Honourary	Dawson Creek	British Columbia
Kimberly	Skyrm	Associate	West Springfield	MA
Kurtis	Sobkowich	Associate	Guelph	Ontario
Leonard	Foster	Full	Vancouver	British Columbia
Lora	Morandin	Associate	Victoria	British Columbia
Marilène	Paillard	Full	Deschambault	Quebec
Mark	Winston	Full	Vancouver	British Columbia
Marta	Guarna	Full	Beaverlodge	Alberta
Martine	Bernier	Full	Deschambault	Quebec
Mary	Reed	Associate	College Station	Texas
Medhat	Nasr	Full	Edmonton	Alberta
Megan	Colwell	Associate	Winnipeg	Manitoba
Melanie	Kempers	Full	Guelph	Ontario
Melissa	Girard	Full	Neuville	Quebec
Michael	Peirson	Full	Beaverlodge	Alberta
Michael	Zabrodski	Associate	Saskatoon	Saskatchewan
Miriam	Bixby	Associate	Victoria	British Columbia
Monica	Winkle	Full	Truro	Nova Scotia
Mylee	Nordin	Associate	Niagara on the Lake	Ontario
Nicolas	Tremblay	Full	Deschambault	Quebec

Nuria	Morfin	Full	Abbotsford	British Columbia
Olav	Rueppell	Full	Edmonton	Alberta
Oleksii	Obshta	Associate	Saskatoon	Saskatchewan
Olivia	de Herdt	Full	Edmonton	Alberta
Patricia	Wolf Veiga	Full	Beaverlodge	Alberta
Paul	Kelly	Full	Guelph	Ontario
Paul	Kozak	Full	Guelph	Ontario
Paul	van Westendorp	Full	Abbotsford	British Columbia
Phil	Craft	Associate	Wilmore	Kentucky, USA
Pierre	Giovenazzo	Full	Québec	Quebec
Rassol	Bahreini	Full	Edmonton	Alberta
Renata	Borba	Full	Edmonton	Alberta
Rhéal	Lafrenière	Full	Winnipeg	Manitoba
Rhonda	Thygesen	Associate	Surrey	British Columbia
Rob	Currie	Full	Winnipeg	Manitoba
Rob	Rupert	Full	Thunder Bay	Ontario
Rodrigo	Ortega Polo	Full	Lethbridge	Alberta
Samantha	Muirhead	Full	Edmonton	Alberta
Sarah	Biganski	Associate	Saskatoon	Saskatchewan
Sarah	Wood	Associate	Saskatoon	Saskatchewan
Scott	MacFarlane	Associate	Napan	New Brunswick
Sebastian	Ibarra	Full	Charlottetown	PEI
Shelley	Hoover	Full	Lethbridge	Alberta
Stephanie	Otto	Full	London	Ontario
Stephen	Page	Full	Ottawa	Ontario
Stephen	Pernal	Full	Beaverlodge	Alberta
Susan	Chan	Full	Lakefield	Ontario
Taeyoon	You	Associate	North York	Ontario
Tara	Galpin	Full	Salt Spring Island	British Columbia
Timothy	Olchowy	Full	Calgary	Alberta
Valérie	Fournier	Full	Québec	Quebec

Appendix 7: 2022 AGM Photo