Canadian Association of Professional Apiculturists
Statement on Honey Bee Wintering Losses in Canada (2020)

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Summary

The Canadian Association of Professional Apiculturists (CAPA) and Provincial Apiarists coordinated the annual honey bee wintering loss report for 2019-2020. 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 410,451 honey bee colonies across Canada, representing 50% of all colonies wintered during 2019-2020. The national winter loss, including non-viable bee colonies, was 30.2% with provincial losses ranging from 16.9% to 40.5%. The overall national colony loss reported in 2020 is in the higher range of reported losses since 2007. Through the hard work of beekeepers replacing losses and making increases, Statistics Canada reports show that the total colony count across Canada has increased by 34.8% during the period between 2007 and 2019.

Respondents reported some variation in identifying and ranking the top four possible causes of colony losses across the country. The most frequently cited causes were weather, poor queens, starvation, followed by weak colonies in the fall.

Beekeepers also responded to questions on the management of three serious parasites and pathogens to beekeeping: *Varroa destructor* mites, *Nosema spp*. and *Paenibacillus larvae* (the causal bacterium of American foulbrood disease). 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. Nosemosis and American foulbrood were treated by many Canadian beekeepers. In 2019, the supply of Fumagilin-B® was disrupted leading to delayed or absence of treatment for nosemosis in beekeeping operations where this treatment has typically been used in the past. 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 agents and researchers have been working with beekeepers across Canada to encourage them to monitor for honey bee pests, especially varroa mites and nosema, and adopt recommended integrated pest management practices to keep these pests under control. Through working groups encompassing diverse stakeholders, CAPA members continue to work on developing and improving management options for beekeepers to keep healthy bees.

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 and Geoff Wilson, 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 2020, the Provincial Apiarists and the CAPA National Survey Committee members reviewed the questions used in the 2019 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. The result was an updated harmonized set of questions that was used in the 2020 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 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:

$$\text{Percentage Winter Loss} = \left(\frac{\text{Sum of the estimated total colony losses per province in spring 2020}}{\text{Sum of total colonies in operation in each province for 2019}}\right) \text{x } 100$$

Results

Throughout Canada, a total of 524 beekeepers responded to the 2020 survey. These respondents represented 35% of all the surveyed beekeepers. Respondents operated 50% of all registered colonies that were wintered in the fall of 2019. Although the number of respondents decreased from the 2019 survey (44%), 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 30.2% with individual provinces ranging from 16.9% to 40.5%. The overall winter loss for 2019-2020 was higher than 2018-2019 which had a loss rate of 25.7%. The level of winter loss varied from province to province, and among beekeeping operations within each province. In general, most provinces reported lower mortality in 2019-2020 than the previous year, the exceptions being Nova Scotia reporting similar mortality to last year, and Quebec, Manitoba and Alberta reporting higher mortalities than last year. Alberta reported the highest winter losses of 40.5% in 2020 with weather cited as being the most frequent cause contributing to colony mortality. The lowest winter loss (16.9%) was reported by Prince Edward Island.

Overall 70% of the colonies owned by respondents were wintered outdoors in fall 2019, with remaining colonies (30%) wintered indoors (Table 2). The highest percentage of colonies wintered indoors was in Nova Scotia and Quebec (75%), followed by New-Brunswick (54%) and Manitoba (49%). 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 (2019-2020) by province

Province	Total number of colonies operated by respondents in 2019	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)	Size of beekeeping operations targeted by survey (# colonies)	Number of respondents' colonies that were wintered in fall 2019	Number of respondents' colonies that were alive and viable in spring 2020	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	396	71	Email	10	9 (90%)	≥ 20	396	325	100%	**17.9%**
Prince Edward Island	5 500	924	Email, Telephone	40	19 (48%)	All sizes	4 602	3 826	84%	**16.9%**
Nova Scotia	25 268	4 902	Email	40	13 (33%)	≥ 50	14 381	11 595	57%	**19.4%**
New Brunswick	11 302	2 814	Email, Telephone, Postal	35	18 (51%)	≥ 50	10 198	7 663	90%	**24.9%**
Quebec	67 025	22 675	Email, Telephone	333	80 (24%)	≥ 10	27 166	17 977	41%	**33.8%**
Ontario	88 723	16 946	Online, Telephone	119	59 (50%)	≥ 50	40 562	32 831	46%	**19.1%**
Manitoba	114 668	28 282	Email	224	67 (30%)	≥ 50	52 334	39 426	46%	**24.7%**
Saskatchewan	115 000	23 160	Online	120	38 (32%)	≥ 100	38 234	30 534	33%	**20.1%**
Alberta	309 230	138 022	Online	174	87 (50%)	≥ 100	172 640	102 682	56%	**40.5%**
British Columbia	57 313	11 648	Online	407	134 (33%)	≥ 10	49 938	39 789	87%	**20.3%**
CANADA	**794 425**	**249 444**		**1502**	**524 (35%)**		**410 451**	**286 648**	**50%**	**30.2%**

Table 2: Overwintering method by province as reported by responding beekeepers - Fall 2019

Province	Outdoors		Indoors	
	Number of colonies	Percent (%)	Number of colonies	Percent (%)
NFL	342	86	54	14
PEI	4 602	100	0	0
NS	3 635	25	10 746	75
NB	4 685	46	5 513	54
QC	6 912	25	20 254	75
ON	27 216	67	13 346	33
MB	26 690	51	25 644	49
SK	33 415	87	4 819	13
AB	139 472*	81	33 168	19
BC	49 147	98	791	2
Canada	**296 116**	72	**114 335**	28

*Includes AB colonies overwintered in BC

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

Province	Outdoors			Indoors		
	Total number of colonies in fall 2019	Total number of viable colonies in spring 2020	Percent of losses of colonies (%)	Total number of colonies in fall 2019	Total number of viable colonies in spring 2020	Percent losses of colonies (%)
NFL	342	283	17.3	54	42	22.2
PEI	4 602	3 826	16.9	0	0	N/A
NS	3 635	2 743	24.5	10 746	8 852	17.6
NB	4 685	3 477	25.8	5 513	4 046	26.6
QC	6 912	4 508	34.8	20 254	13 469	33.5
ON	27 216	21 253	21.9	13 346	11 578	13.3
MB	26 690	19 315	27.6	25 644	20 111	21.6
SK	33 415	26 873	19.6	4 819	3 661	24.0
AB	139 472	88 797	36.3	33 168	13 885	58.1
BC	49 147	39 321	20.0	791	468	40.8
Canada	296 116	210 396	28.9	114 335	76 112	33.4

Contributing factors as cited by beekeepers

Beekeepers were asked to rank possible contributing factors to colony losses. These responses are summarized in Table 4. Weather, poor queens and starvation were considered as important factors for winter loss across the country. Beekeepers reported that a considerable number of colonies perished in April and into early May, likely as a consequence of cold spring weather.

In seven provinces, poor queens were reported as the second most common factor contributing to reported winter losses. 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.

Starvation was a frequently reported cause of winterkill 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 2019-20, starvation may also have been associated with increased consumption of stored honey or sugar syrup during the extended cold weather in the spring of 2020.

Another contributing factor identified across Canada 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 second or fourth possible contributing factor to winter colony loss in only three provinces. 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 treating for varroa using multiple treatments per year. Unfortunately, some individual producers treat for varroa too late in the season, which results in wintering bees being less healthy from the impacts of varroa and associated viruses. Some treatments may also be affected by environmental factors during fall months, when the weather is cold. Monitoring varroa levels, selecting effective treatments and verifying treatment efficacy are all necessary elements of an effective management strategy for this economically-important pest.

Several 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.

Operations that reported greater than 25% winter losses were asked to rank the top four possible causes of bee colony mortality in the 2019-2020 survey. These data are summarized in Table 5. Weather, starvation and poor queens remain the 3 most-cited causes of winter loss, followed by weak colonies in the fall for these operations. 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 4: Top four ranked possible causes of honey bee colony mortality by province, as cited by beekeepers who responded to the 2019-2020 winter loss survey

Province	**1st.**	**2nd.**	**3rd.**	**4th.**
NL	Weak colonies in the fall	Weather	Starvation	Poor queens
PEI	Starvation	Poor queens	Poor weather	Weak colonies in the fall
NS	Weather	Starvation*	Poor queens*	Weak colonies in the fall
NB	Weather	Poor queens	Weak colonies in the fall	Don't know
QC	Weak colonies in the fall*	Poor queens*	Weather	Ineffective varroa control
ON	Other (pesticides and varroa from nearby beekeepers)	Poor queens	Weather*	Starvation*
MB	Starvation	Poor queens	Weather	Weak colonies in the fall
SK	Starvation	Poor queens	Nosema	Weather
AB	Weather	Poor queens	Starvation	Ineffective varroa control
BC	Weak colonies in the fall	Ineffective varroa control	Starvation	Weather

* indicate causes that were equally ranked in their respective province.

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 2019-2020 winter loss survey

Province	1st.	2nd.	3rd.	4th.
NL	Weather	Starvation	Poor queens	Weak colonies in the fall
PEI	Poor queens	Weather	Starvation	Nosema
NS	Weather	Starvation	Weak colonies in the fall	Poor queens
NB	Don't know	Weather	Poor queens	Weak colonies in the fall
QC	Weather	Ineffective varroa control	Weak colonies in the fall	Poor queens
ON	Weather	Poor queens	Weak colonies in the fall	Starvation
MB	Starvation	Weather	Poor queens	Don't know
SK	Starvation	Poor queens	Nosema	Starvation
AB	Weather	Poor queens	Starvation	Ineffective varroa control
BC	Weak colonies in the fall	Ineffective varroa control	Starvation	Weather

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[1]

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

[1] No varroa mites are found in Newfoundland and Labrador; data were only analyzed for provinces having this pest.

During the 2019 production season, a large majority of surveyed beekeepers monitored for varroa mite infestations (Table 6). 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 (38%). The frequency of use for the alcohol wash technique in various provinces ranged from 29% to 90%. The frequency of use for the sticky board method ranged from 0% to 54%. 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 are always sought.

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 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 2019 season". Beekeepers' responses are summarized in Table 6. In the spring of 2019, the percentage of beekeepers that treated with chemical methods ranged from 35% in Quebec to 95% in Saskatchewan. The main miticide used for spring varroa control was Apivar® (a synthetic miticide with the active ingredient amitraz). The second most common treatment was formic acid in late spring, followed by oxalic acid. In fall of 2019, most Canadian beekeepers ranging from 29% in Manitoba to 100% in Ontario 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 2019, 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 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, 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 6: Varroa monitoring and chemical control methods as cited by the respondents of the 2019-2020 winter loss survey. Chemical treatment is in order from most to least commonly used.

Province	Beekeepers screening for varroa mites		Varroa control: treatment and methods			
			Spring 2019		Summer/Fall 2019	
	Sticky boards (%)	Alcohol wash (%)	% of beekeepers	Methods of treatment	% of beekeepers	Methods of treatment
NL	0	67	N/A	N/A	N/A	N/A
PEI	11	74	68	Apivar®, liquid Formic acid, Mite Away Quick Strips®	90	Oxalic acid, Apivar®, liquid Formic acid
NS	31	62	92	Apivar®, Apistan®, Mite Away Quick Strips® & Oxalic acid	92	Apivar®, Mite Away Quick Strips®, Oxalic acid
NB	17	28	44	Apivar®, Oxalic acid, liquid Formic acid	94	Apivar®, Oxalic acid, liquid Formic acid
QC	54	29	35	Liquid Formic acid, Apivar® & Thymovar® & Mite Away Quick Strips® & Oxalic acid	88	Liquid Formic acid, Oxalic acid, Apivar®
ON	15	78	89	Apivar®, liquid Formic acid, Oxalic acid	100	Apivar®, Oxalic acid, liquid Formic acid
MB	10	58	75	Apivar®, Formic acid, Oxalic acid	29	Oxalic acid, Apivar®, Formic acid
SK	5	90	95	Apivar®, Oxalic acid, Apistan®	84	Oxalic acid, Apivar®, Formic acid
AB	23	74	67	Apivar®, Oxalic acid, Formic acid	76	Oxalic acid, Apivar®, Formic acid
BC	0	31	72	Formic acid, Apivar®, Oxalic acid	85	Formic acid, Oxalic acid, Apivar®

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. In certain regions and under specific circumstances this parasite may have an impact and play a role in spring build up (Guzman *et al*., 2010). It was not cited by all surveyed beekeepers as a possible cause of colony mortality during the 2019-2020 winter loss survey, except in Saskatchewan, and in Prince Edward Island for operations with more than 25% losses.

In the survey, beekeepers reported the use of fumagillin for the treatment of nosemosis in spring and/or in fall of 2019 (Table 7). 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. It was also noted that there was a slight disruption in the supply of Fumagilin-B® during the spring and fall 2019, leading some beekeepers to apply the product late in the season, to replace fumagillin with a probiotic or prebiotic treatment, or not to treat altogether. 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 uncertainty surrounding 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.

Table 7: Antibiotic (fumagillin) and alternative treatments for nosemosis as cited by the respondents of the 2019-2020 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	0	0	N/A	0	0	N/A
PEI	18	0	N/A	17	0	N/A
NS	23	0	N/A	23	0	N/A
NB	6	0	N/A	17	0	N/A
QC	3	4	Probiotics, Hive Alive	4	6	Apple cider vinegar, probiotics, Hive Alive
ON	7	3	Comb replacement, tea tree oil	17	6	Comb replacement, tea tree oil
MB	7	6	N/A	7	4	N/A
SK	13	13	Probiotics	29	0.2	Probiotics
AB	19	6	Prohealth, Hive Alive, Bee Strong	39	6	Prohealth, Bee Strong, Nozevit, Hive Alive
BC	16	0	N/A	13	0	N/A

C. American foulbrood management practices

American foulbrood (AFB) is a bacterial disease of brood caused by *Paenibacillus larvae*. AFB is considered endemic in Canada, and it has been of great concern to beekeepers. 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 8. Oxytetracycline was more frequently used by beekeepers in spring and fall than other treatments.

Table 8: Antibiotic treatments for American foulbrood (oxytetracycline, tylosin and lincomycin) as cited by the respondents of the 2019-2020 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	13	3	0	18	0	0
NS	23	0	0	15	0	0
NB	61	0	0	22	0	0
QC	5	0	0	1	0	0
ON	73	0	0	56	3	0
MB	29	0	0	18	6	0
SK	45	0	0	55	3	0
AB	23	0	0	25	10	0
BC	6	<1	0	4	2	0

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 30.2%. 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. 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 2010 to 2020, the national winter losses ranged from 15.3% to 32.6%, averaging 24.3%. During the period between 2007 and 2019 Statistics Canada reports showed that the total colonies in Canada increased by 34.8%.

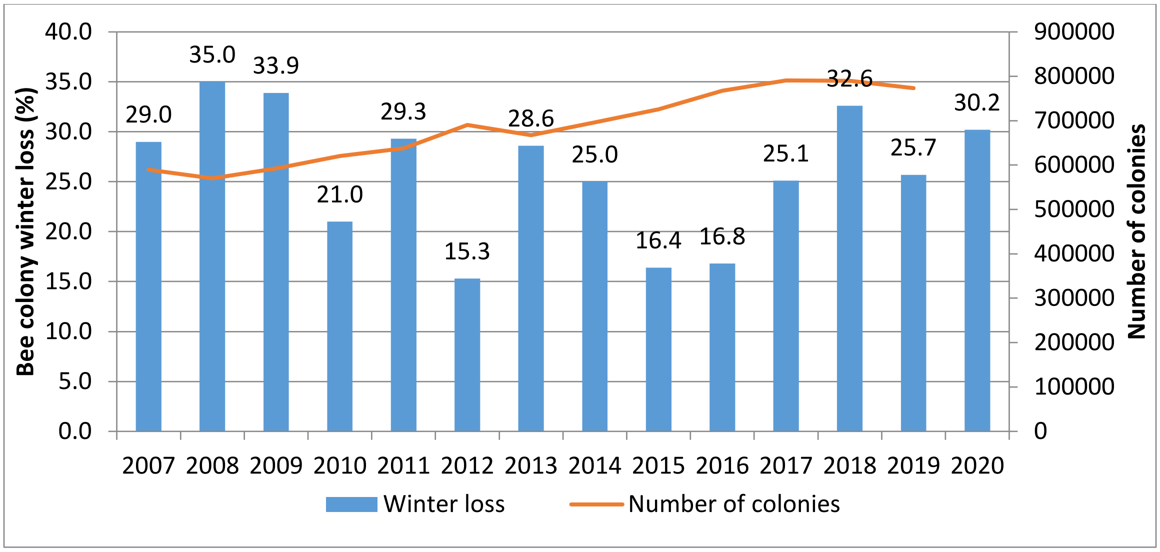

Figure 1. Summary of bee colony numbers and bee losses in Canada from 2007-2020 (based on data as reported by Stats Canada)

Individual beekeepers experiencing high winter losses face considerable expenses replacing dead colonies. These increased expenses greatly affect profitability and can put some beekeeping operations at risk of going out of business. 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.

Since the inception of this harmonized survey in 2007, beekeepers have faced challenges keeping healthy bees. 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 beekeepers from various regions are using recommended practices for monitoring and managing honey bee pests and diseases, there are always the opportunities to make further improvements.

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 to 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 and the Provincial Apiarists are also 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 hopefully enhance the integrated pest management (IPM) practices and address honey bee health sustainability.

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Appendix A: List of Canada's Provincial Apiarists

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Appendix B: CAPA - 2020 Core Winter loss survey questions

The followings are the core questions that will be used in 2020 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[2] were put into winter in fall 2019?

Outdoor wintering	Indoor wintering	Total

2. How many full sized colonies[1] survived the 2019/2020 winter and were considered viable[3] 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 2019**? What percent of hives were treated? *(Choose all that apply)*

	Treatment	Percent of hives treated (%)
☐	Apistan (fluvalinate)	
☐	CheckMite+ (coumaphos)	
☐	Apivar (amitraz)	
☐	Thymovar (thymol)	
☐	Bayvarol (flumethrin)	
☐	65% formic acid – 40 ml multiple application	
☐	65% formic acid – 250 ml single application	
☐	Mite Away Quick Strips (formic acid)	
☐	Oxalic acid	
☐	Other *(please specify)* ________________________	
☐	None	

[2] Does not include nucleus colonies

[3] 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.

4. Which method of treatment did you use for varroa control in late **summer/fall 2019**? 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)	
☐	65% formic acid – 40 ml multiple application	
☐	65% formic acid – 250 ml single application	
☐	Mite Away Quick Strips (formic acid)	
☐	Oxalic acid	
☐	Other *(please specify)* ________________________	
☐	None	

5. Have you monitored your colonies for varroa during the 2019 season?
   - ○ Yes – sticky board
   - ○ Yes – alcohol wash
   - ○ Yes – other (*please specify*) ____________________________
   - ○ No

6. Which method of treatment did you use for **nosema** control in **spring 2019**? 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 2019**? What percent of hives were treated?

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

8. Which method of treatment did you use for **American foulbrood** control in **spring 2019**? What percent of hives were treated? *(Choose all that apply)*

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

9. Which method of treatment did you use for **American foulbrood** control in **fall 2019**? What percent of hives were treated? *(Choose all that apply)*

	Treatment	**Percent of hives treated (%)**
☐	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*) _________________________	