NLBKA
Newfoundland and Labrador Beekeeping Association

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Preliminary Analysis of the 2017-2018 NLBKA Honey Bee Colony Loss and Management Survey

NLBKA SCIENTIFIC ADVISORY REPORT

2018 Survey Return Rate of 63% is Fantastic!

The objective of the annual survey is to build a database for assessing the health of NL honey bees, and document management practices which may affect their health. Our second survey consisted of 52 questions (9 more than 2017 survey) covering demographics, hive design, forage food, pollination & honey production, diseases, pesticides, queen health, apiary locations as well as summer (May 22-October 31, 2017) and winter (November 1, 2017 - May 21, 2018) losses. Instead of a general paper mailout, as was done in 2017, the survey was posted on an internet platform (docs.google.com/forms) and an invitation to participate in the survey was emailed to 65 persons: 55 current members and 10 non-members. Only beekeepers who had hives for at least one year were included; no beekeepers met that criteria for Labrador. To ensure confidentially and anonymity of respondents, the results are presented here in aggregated form.

Table 1. Number and percent of respondents by NL electoral regions.

Region	No. Respondents	%
Avalon	24	58.5
Bonavista-Burin	9	22.0
Coast of Bays - Central Notre Dame	4	9.8
Long Range Mountains	2	4.9
Blank/prefer not to say	2	4.9
Total	**41**	**100.0**

Demographics, Hive Design & Habitat

Forty-two respondents completed the survey, of which one was invalidated and removed, leaving a return rate of 63%, compared to the 2017 return rate of 73%. Twenty-three percent of beekeepers had kept bees a full year, 43% for 2-4 years, 25% for 5-10 years and 10% for greater than 10 years. Table 1 gives the breakdown of returns by regions and shows most apiaries are on the Avalon. Ninety percent (90%) of beekeepers were using either standard or modified Langstroth designs, and 10% were using a top bar design; and 98% preferred using plastic foundation. Eighty-five percent indicated they kept bees as a hobby.

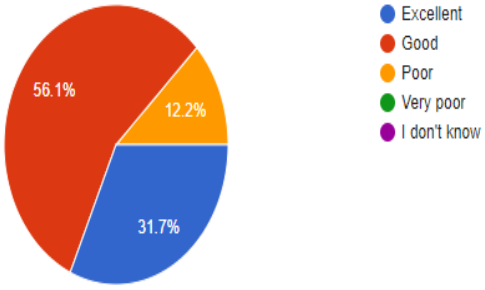


Fig.1. Respondents' description of diversity of honey bee forage within 5 km of their apiaries.

Beekeepers ranked the types of habitat within a 5 km radius of their apiary as follows: natural landscape, 1st; urban landscape, 2nd; near large body of water, 3rd; disturbed landscape & agricultural, 4th & 5th. Surrounding wild/cultivated crop forage were ranked as fruit bearing bushes, 1st; flowering vegetables & fruit trees, 2nd; and hay, a close 3rd. Eighty-eight percent classified the diversity of forage as good to excellent (Fig. 1). Similar to the 2017 survey, the majority (53%) of beekeepers were unaware of any pesticides being used in their areas, while 25% reported agricultural & 23% landscape spraying. Ten percent of respondents moved their hives for pollination services during the summer.

Summer Colony (May 22 –October 31, 2017) Losses by Operation Type

Thirty-three beekeepers, who provided valid responses, managed 220 colonies at the start of, and 278 colonies at the end of summer, going into winter (Table 2). Total colony losses were 37.5%, with an average of 14.1% losses per beekeeper operation. Because commercial beekeepers manage a disproportionate number of colonies compared to other operations, average colony losses per beekeeper operation is more relevant than total when comparing losses (see footnote pg.3). For example, 85% of respondents were backyard beekeepers managing an average of 2.2 colonies, 9% were sideliners managing 12.3 colonies and 6% were commercial managing 59.5 colonies. Average operational losses of 50.2 % per commercial beekeepers were much higher than the approximately 12% losses estimated for both backyard and sideline operations. Average losses are calculated indirectly by estimating change in colony numbers to include fluctuations caused by colony splitting (net interim change), a practice more frequent in commercial operations than in backyard and sideline operations.

Of the 15% of beekeepers who reported losses, queen failure, poor spring conditions, and weak colonies after winter were ranked as the leading causes. Those who had bees in 2016, reported that the 2017 summer loss pattern was either higher (13%), same (53%) or lower (6%). Twenty-three % of all respondents had to replace a queen during the summer; up from 13% in 2016. Two beekeepers reported treating their colonies (<20%) with fumagillin.

Table 2. Total and average summer colony losses, with total number of colonies for each time period. Net interim change includes the number of increases by splits or purchases (+) and decreases from selling or giving away (-).

Operation Type	Operation Size	Number of colonies on May 22, 2017	Net Interim Change	Number of colonies on Oct 31, 2017	% Total losses	Average colony losses %
Backyard	**<10 hives; (n=28)**	64	46	94	14.5	11.7
Sideline	**10-19 hives (n=3)**	37	28	58	10.8	11.5
Commercial	**≥20 hives (n= 2)**	119	151	126	53.3	50.2
TOTAL		**220**	**225**	**278**	**37.5**	**14.1**

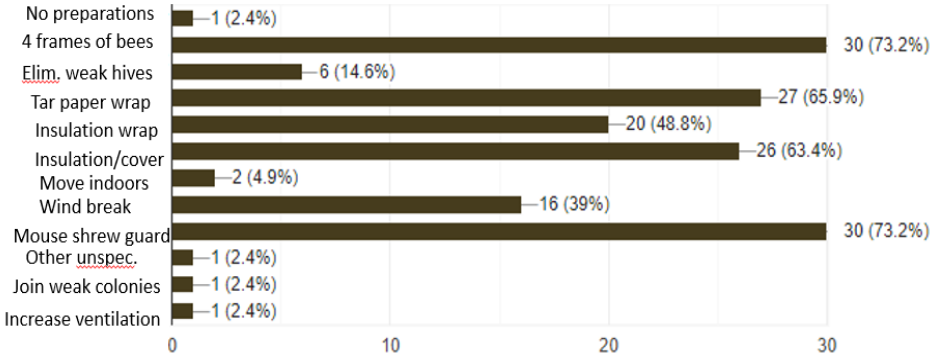
Calculation equations for summer losses source: Bee Informed Partnership 2017; n=number of beekeeping operations

Honey Harvest in 2017

Forty-eight percent of beekeepers in the survey harvested honey during the summer of 2017. Many of those, and other respondents, also left honey for winter feeding, or removed it for spring feeding and nuc colony-making. Total amount of honey harvested by 18 beekeepers was 3465 kg from 171 producing colonies.

2017 Fall Management Preparations for Winter

In preparation for the winter of 2017-2018, 41 beekeepers used several management practices to prepare their apiaries for winter. These are ranked as follows: ensuring each hive deep had 4 or more frames of bees (i.e. a viable colony); installation of shrew/mouse guards; insulation inside of outer cover; wrapping exterior of hives with tar paper and/or other insulation material; and building wind breaks. Only 17% reported cutting their losses by eliminating weak hives before the start of winter. One beekeeper ensured their hives had lots of ventilation.



Winter Losses: Nov. 1, 2017 to May 21, 2018

The Canadian Association of Professional Apiculturists (CAPA) uses the following formula to calculate the percentage of total winter losses as follows: (***Sum of estimated colony losses in spring 2018/Sum of colonies wintered in 2017) x 100.***

Thirty-five beekeepers provided valid responses of which 51% reported colony losses during the winter, i.e. 55 colonies. The total winter colony losses was estimated to be 18.7% (Table 3). This is 1.1% higher than that estimated for winter of 2016/2017, which had fewer commercial respondents. Going into the 2017/2018 winter, 4 beekeepers had 20 or more colonies*. The amount of non-viable colonies was also estimated to be 18%, and these colonies would require intervention to survive. When compared to 2016/2017 winter, beekeepers reported that losses were higher (22.2%), the same (36.1%) or lower (19.4%). Overall, at the start of 2017/2018 winter, 90.5% of 297 colonies were wintered outdoors and the remainder were wintered indoors.

Regional analysis showed that the Avalon had the highest losses (23.9%), followed by Coast of Bays/Central Notre Dame (20.0%), Long Range Mountains (15.5%), and Bonavista-Burin-Trinity had the lowest losses (10.6%). No discernible trends in losses were noted, however, differences may be explained by varying spring weather conditions, timing of natural pollen availability, and the onset of daily honey bee foraging flights.

* Note: The numbers of wintering colonies in Table 3 differ somewhat from those in Table 2. In calculating summer losses, only those respondents who provided valid data on colony strengths at the beginning and end of summer could be used. Bee Informed Partnership equations were used to calculate total and average losses per operation type.

Estimating Winter Colony Losses

In our survey, three questions were directed towards estimating colony loss. Beekeepers were asked to provide the total number of living colonies (no nucs) that were overwintered on October 31, 2017. They were asked to provide the total number of surviving colonies considered viable on May 21, 2018. And finally the last question asked was how many of these surviving colonies were considered weak on May 21, 2018.

The CAPA definition of a viable colony is one where there are 4 or more frames being 75% of comb covered on both sides in a standard 10 frame hive. In NL, it is recommended that a two deep hive is needed to get through the winter. When checking the hive after winter, anything less than 4 frames per deep covered in bees is deemed a non-viable colony. Those are the colonies in the spring that should be either merged with another, the queen replaced or both; otherwise those colonies will not survive.

How Did NL Compare to Other Beekeepers in Atlantic Canada?

The 2018 CAPA survey statement for all provinces reported a 2017/2018 winter loss in commercial operations for the Atlantic provinces as follows: 25.8% in NL*; 18.4% in NS, 30.3% in NB and 41.8% in PEI. Total colony loss for Canada was estimated at 32.6%; NL ranks the third lowest in colony losses.

For Atlantic Canada, CAPA ranked contributing factors for commercial honey bee losses as: weather, 1st; weak colonies in the fall, 2nd; with poor queens and starvation tied for third place.

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Footnote

***CAPA 2018 estimate of 25.8% for 4/5 NL commercial respondents was higher than the 18.7% estimate from NLBKA's four commercial respondents. Apparently, the same 4 commercial operators did not respond to both surveys.**

Using the CAPA-NL 2018 commercial data with estimates of backyard and sideline beekeepers from the NLBKA survey, total winter colony losses were estimated to be 22.9%, and average losses were estimated to be 23.8% . All 3 survey estimates are higher than the 14% 2016/2017 commercial winter colony losses, reported by NL provincial apiarist (K. Kennedy 2019, personal communication), indicating an increasing trend in total colony losses for commercial operations since the 2015/2016 winter period.

Winter Loss Rate Is Related to Size of Operation

At the end of fall in 2017, 77% of respondents were backyard beekeepers, 11% were sideline beekeepers and 11% were commercial operators. Backyard beekeepers managed 24% of 294 reported colonies, an average of 2.6 per beekeeper; sideline beekeepers managed 18% or 13.3 colonies per beekeeper; and commercial beekeepers managed 58% or 43 colonies per beekeeper.

Total colony losses were the highest for the backyard beekeepers (23.2%), and lowest for the sideline beekeepers (15.1%) (Table 3), however estimating average colony losses per beekeeper operation provides a more comparable measure. Average losses showed a decreasing trend from a high of 26.9% in backyard to 19.5% in commercial keepers. Average losses were higher than total losses which means that during the winter, NL beekeepers lost 18.7% of their colonies, while each beekeeper lost on average 24.4% of their colonies.

Although 45.2% of backyard and sideline operations reported some losses, all commercial beekeepers reported losses but their average rate was lower. Wintering hives indoors, merging weak colonies in the fall prior to the start of winter, and other management practices learned by years of experience may account for some of the lower average losses when compared to smaller operations.

Table 3. Total colony losses estimated by size of operation using CAPA's protocol, & BIP* average colony losses.

Operation Type	Size of operation	No. of respondents' colonies wintered November 1, 2017	No. respondents' colonies that were alive & viable on May 21, 2018	Number of colony losses on May 21 2018	Total winter losses including non-viable colonies (%)	Average Colony Losses %
Backyard	<10 hives (n=27)	69	53	16	**23.2**	**26.9**
Sideline	10-19 hives (n=4)	53	45	8	**15.1**	**20.9**
Commercial	≥20 hives (n=4)	172	141	31	**18.0**	**19.5**
Total		**294**	**239**	**55**	**18.7**	**24.4**

*Calculation equations for summer losses source: Bee Informed Partnership 2017; n=number of beekeeping operations.

Reported Causes of Winter Loss

Respondents were asked to rank contributing factors to colony losses. Both weather and weak colonies in the fall tied for 1st place followed by queen failure in second place (Fig. 3), similar to that reported in the CAPA 2018 report (see sidebar) for Atlantic provinces. Other NL reported causes, in order, were "natural disasters", starvation and nosemosis. One beekeeper treated <10 % of their colonies in the spring of 2018 with fumagillin. One other respondent reported not knowing the cause of their losses. With the exception of nosemosis, all other contributing factors can be mitigated with good and timely management practices.

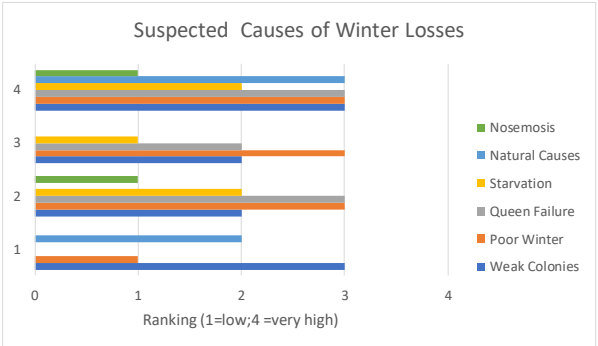

Fig.3. Respondents' reported causes of 2017/2018 winter losses.

Spring Management Practices, March 1– June 1, 2018

Spring management generally begins on a mild day in late March or mid-April when the cover is lifted off the hives to see if the colonies survived the winter, and whether there is sufficient food accessible to the colonies. Seventy-three percent of beekeepers reported using honey or sugar-based food supplements, and 50% reported using food proteins to stimulate egg laying throughout the spring period. Similar to 2017 survey results, sugar syrup and pollen substitute patties were the most popular choices for food supplementation (Figs. 4 & 5). Many beekeepers used either a combination of sugar types, and /or pollen supplements for a period of at least 1 week to greater than 5 weeks. The latter was probably a reflection of poor spring weather conditions and late spring flowering.

The 2018 survey included for the first time 3 questions concerning monitoring of colonies for diseases and pests. Two respondents were screened out due to missing or questionable data. Of the 39 respondents, 72% said they inspected their hives for disease and pests after winter. Of those responses, 4 beekeepers reported nosemosis: 3 beekeepers had < 10% infected colonies; and 2/3 beekeepers treated the disease with fumagillin. Another beekeeper reported nosemosis in 10-20% of their colonies, but used no treatment. No other diseases or pests were reported.

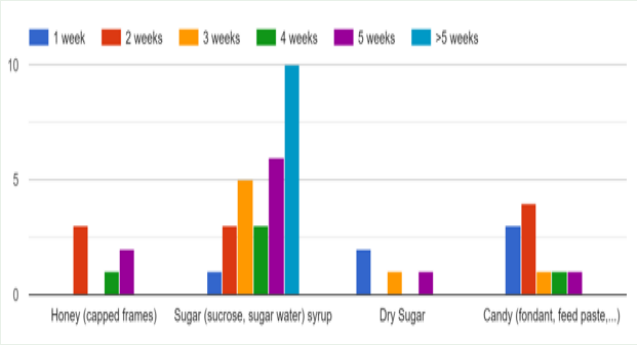

Fig. 4. Ranking of early spring honey and sugar feeding preferences and length of feeding schedules.

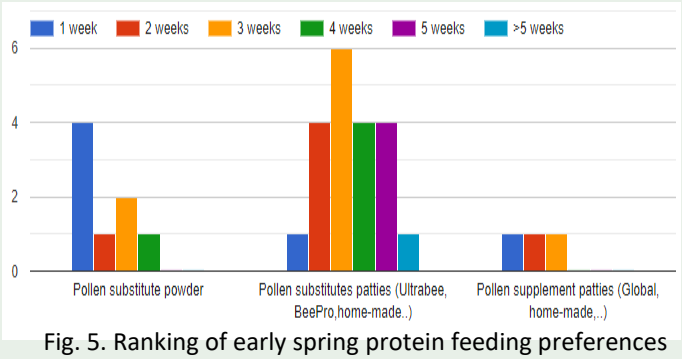

Fig. 5. Ranking of early spring protein feeding preferences and length of feeding schedules.

Hive Manipulation, Requeening, and Age of Brood Comb

After a typical winter, beekeepers recover their losses by splitting colonies and adding or making new queens. Hive manipulation is a standard practice to equalize colony strength in the spring. Yet, only 28% of 39 beekeepers reported doing this in the spring of 2018, 5% higher than that estimated in the 2017 survey.

Queen replacement after winter was slightly lower (3%) than in the spring of 2017. For 2018 spring period, 27% of beekeepers said they would replace queens because of problems during the winter. Of the 17 respondents, who replaced queens, 53% would rely on natural re-queening, 35% would introduce either virgin or mated queens, and 18% would introduce queen-right nucs or queen cells.

Of the 40 respondents, 20% of beekeepers reported their queens were between 8-12 months old; 63% were between 1-2 yrs. old, and 10% were older than 2 years.

When asked about overall replacement rate, 18% replaced their queens every two yrs., 15% every 3 yrs., and 20% of respondents said they never replaced their queens because their colonies requeened themselves.

Thirty-three percent of beekeepers raised their own queens, 27.8% were obtained from local NL breeders, and 17% from swarms. Several respondents reported using more than one queen source.

A question on the age of brood comb, an important area that is related to colony health, was added in this survey. A majority of the 40 respondents' brood comb was between 1– 2 yrs. (43%), 2-3 yrs. (38%) and 4-5 yrs. (13%). Comb replacement is often recommended because pathogens, pesticides, and other chemicals can accumulate in the wax over time, potentially affecting colony health.

NLBKA Scientific Advisory Committee

Our committee is mandated to work with all beekeepers to better understand which management practices, climate, forage conditions, diseases and pests affect honey bee health. One way to improve our understanding is to conduct annual surveys and share the results with the beekeeping community.

In the 2017 survey, commercial beekeepers were under-represented. More effort will be deployed to increase their participation.

As we build our database, we may make it accessible to other bee researchers who wish to study the ecology, diseases, and pest profiles of our honey bees.

Summary and General Conclusions

This is the second annual survey to report summer and winter losses and beekeepers' management practices. Total winter colony loss from the 2018 survey was estimated at 18.7%, however, when the 2018 CAPA survey estimates for NL commercial losses were combined with NLBKA backyard and sideline losses, total loss increased to 22.9%. Both estimates were slightly higher than the 17.6% reported in the 2017 survey. During the summer of 2017, backyard and sideline beekeeping operations had lower average losses when compared to commercial operations, and that trend was reversed in the 2017/2018 winter when average losses per commercial beekeeper were much lower. Experienced commercial beekeepers have access to better management capacity which may explain their lower winter losses when compared to smaller operations.

Estimates of total colony losses, in summer and winter, are highly influenced by commercial beekeepers, who manage a disproportionate number of colonies, and are an indication of provincial losses. Estimating average colony losses is more informative when comparing sub-groups of operations. While both CAPA and NLBKA surveys estimate commercial losses, they differ in that the NLBKA survey covers all beekeepers and the entire year. Measuring both summer and winter losses will provide a more complete picture of honey bee health.

Queen failure, poor spring conditions, and weak colonies after winter were the leading causes of summer losses in 2017. Similarly, the leading causes of winter losses were weak colonies going into winter, poor weather conditions and queen failure, which is also supported by CAPA 2018 findings for Atlantic Canada beekeepers. All can be mitigated somewhat with timely management practices. Noteworthy, reports of nosemosis are on the increase and the disease may have contributed indirectly to some colony losses in both seasons. Growing awareness among all respondents in monitoring their colonies for diseases and pests is encouraging.

Tremendous thanks to all survey respondents whose efforts made this survey such a success!

NLBKA Scientific Advisory Committee

Thank you for participating in our second survey! This survey helps NLBKA anticipate beekeeper training and educational needs from one year to the next, and provides other benefits to the beekeeping community.

Watch for the third annual survey in late May.

If you have any suggestions or questions please send them to: research@nlbeekeeping.ca

Training Prospects

In the survey there were 3 multiple choice questions related to how beekeepers acquired their information on beekeeping practices, what training topics they would like to see offered, and delivery methods for further training/ workshop sessions by NLBKA. Fifty-one percent of 40 respondents have completed a course in beekeeping and along with the other 49% also used books and the internet (93%), NLBKA website & newsletters (39%), and relied on a mentor and other beekeepers (56%). Respondents' preferences for workshops were queen rearing (4), hive maintenance (1), pest identification & management (2), top bar hives (1), swarm management (2), basic beekeeping (2), making splits (1), and advanced beekeeping (2). Thirty-four respondents suggested NLBKA investigate the following education methods in Figure 6.

Fig. 6. Preferences for educational methods.