CAPA Statement on Honey Bees Losses in Canada (2011)

In 2011, a core set of harmonized winter loss survey questions was devised by CAPA which was used as a basis for each province to implement its own wintering survey. This approach facilitated direct comparison of key winter loss data across regions. Based on results from nine Canadian provinces, 29.3% of the colonies that were wintered during 2010-11 died or were deemed too weak to be commercially productive. This represents twice the long-term winter loss rate for Canada and a substantial increase over the loss rate for 2009-10 (21.0%).

Table 1. Gross Losses by Province, Winter 2010-11.

Province	Number of Colonies Wintered	Number of Dead or Unproductive Colonies[1]	Wintering Losses (% of Provincial Total)
British Columbia	42,000	11,760	28.0
Alberta	265,000	71,550	27.0[†]
Saskatchewan	101,000	22,220	22.0
Manitoba	80,000	27,200	34.0
Ontario	83,150	35,755	43.0
Quebec	40,000	11,200	28.0
New Brunswick	9,200	3,392	36.9
Nova Scotia	16,500	3,696	22.4
PEI	4,291	990	23.1
CANADA	**641,141**	**187,763**	**29.3%** **(of National Total)**

[1] Dead and commercially unproductive colonies as of 1 May 2011. Figure calculated from provincial loss rates (derived from survey data) and total colonies put into winter.
[†] Based on surveys of producers in Alberta with 400 or more colonies.

General Trends

In the years subsequent to the introduction of the ectoparasitic mite *Varroa destructor* into Canada, normal long-term overwintering mortality has been considered to be 15%. During the winter of 2010-11, mortality due to wintering losses and spring dwindling was 29.3%. This loss is greater than the 2009-10 mortality figure of 21.0% and is similar to the three winters previous: 33.9% (2008-09), 35.0% (2007-08) and 29.0% (2006-07).

Compared with the winter of 2009-10, loss rates across all reporting provinces increased with the exception of Nova Scotia. Highest losses were experienced in the Province of Ontario.

For Canadian beekeepers experiencing the highest levels of loss, a number of common factors were reported by extension professionals. A consistent theme, particularly on the prairies, was the exceptionally cold and in many cases rainy weather during spring 2011 which contributed to increased dwindling and loss of colonies that emerged from winter. These conditions precluded normal cleansing flights by bees and their ability to utilize early season sources of forage. In some areas, exceptionally wet conditions also precluded beekeepers' access to colonies for feeding, resulting in increased levels of starvation. In Alberta, abundant snowfall, cool spring temperatures and numerous precipitation events led to high losses during spring, which were reported to be the principal factors causing higher than normal mortality of colonies.

Across most regions apicultural professionals also listed the following common reasons as sources of higher than normal wintering mortality: 1) higher numbers of weak colonies in the fall months while being prepared for winter, 2) ineffective *Varroa* control leading to higher mite populations on bees over the wintering period, 3) higher than normal rates of queen loss, and 4) high levels of *Nosema spp*.

Losses in Ontario

Though overall losses in Canada generally increased in 2010-11, the Province of Ontario experienced the highest rate of loss of any region in Canada at 43%. The Province of Ontario, in addition to implementing national harmonized survey questions, also devised a thorough wintering survey of its own beekeeping industry in 2010-11. This report may be found at:

http://www.omafra.gov.on.ca/english/food/inspection/bees/2011-winter-loss.htm

The survey revealed a wide range of wintering mortalities among Ontario commercial beekeepers (from 2 to 95%), nevertheless losses were similar among regions within the province. The overall rate of loss in Ontario was the highest recorded since wintering surveys were undertaken in 2002, with the previous highest loss recorded in 2007 (35%). In the winter of 2009-10, wintering loss in Ontario was recorded as being 21.6%, as reported in CAPA's annual statement of national losses.

In Ontario, beekeepers reported mortality to occur because of ineffective *Varroa* control, *Nosema* levels, poor queens, weak colonies and poor weather conditions.

Based on the Ontario survey results, 50.8% of responding beekeepers reported monitoring for *Varroa* mites. All respondents reported treating for *Varroa* in the fall, with 82% treating between late August and mid-September and 12% from late September onwards. No relationship was found between treatment date and levels of wintering mortality.

In Ontario, 37% of respondents used Apivar® (Amitraz), 19.5% used formic acid while smaller proportions of beekeepers used a combination of treatments, including oxalic acid. Few beekeepers (2.4%) used CheckMite+® (coumaphos) and 1.2% used Apistan® (fluvalinate). No relationship was found among *Varroa* treatment methods and rates of loss.

Forty-five percent of Ontario respondents also treated for nosema disease in the fall, however, no difference was found among wintering mortality levels of beekeepers that treated or did not.

Varroa is still considered to be a major factor in colony mortality in Ontario, with the impact of *Nosema ceranae* being less clear. Early spring conditions in Ontario may have led to the production of greater quantities of brood which would have also increased *Varroa* levels more

greatly than in a typical year. A cool, long spring in certain parts of this province is also suggested to have contributed to a greater number of weak colonies and substantial increases in calculated winter mortality as colonies dwindled and died until mid-spring.

Overwintering Losses in the U.S. (Spring 2011) [1]

The information for U.S. losses was derived from a survey commissioned by the Apiary Inspectors of America (AIA) and the USDA. In total, 5,572 American beekeepers responded to the on-line survey
who collectively manage 15% of all colonies in the U.S.

In the United States, a total loss of 30.0% of managed honey bee colonies was recorded. This compares to total losses of 34%, 29%, 35.8% and 31.8% recorded respectively in the winters of 2009/10, 2008/2009, 2007/2008 and 2006/2007.

The American survey also reported that 31% of respondents lost at least some of their colonies with symptoms consistent with Colony Collapse Disorder (CCD).

[1] From: vanEngelsdorp, D., Hayes, J., Caron, D., Wilkes, J., Rose, R. and J. Pettis. 2010. Preliminary Results: Honey Bee Colony Losses in the U.S., Winter 2010-2011. http://www.extension.org/pages/58013/honey-bee-winter-loss-survey

Is CCD in Canada?

Symptoms by which CCD is being characterized in the U.S. have not been diagnosed by professional apiculturists in Canada. Increased levels of colony mortality in Canada are associated with increased levels of winter loss, seen as direct mortality during winter or dwindling during the early spring. The most clearly associated cause of increased winter mortality in Canada has been ineffective *Varroa* control, demonstrated in recent research from Ontario (Guzman et al., 2010). Although many secondary pest, pathogen, environmental or management factors have been suggested to act individually or in combination to impact colony health, further research is required to establish conclusive links to ongoing patterns of colony death.

What is being done in Canada?

Researchers in Canada remain in close contact with principal scientists participating in U.S. working groups on colony losses. Members of CAPA have also been actively monitoring the status of bee health across the country and are sharing scientific information.

Researchers within CAPA are active in evaluating alternative control options for *Varroa* mites, methods of integrated pest management (IPM) for honey bees and the breeding of queen stock more tolerant of diseases and mites. In several regions of Canada workshops have been conducted to promote IPM practices to beekeepers with particular attention given to surveillance programs to monitor pests and diseases, with emphasis on *Varroa* and *Nosema* spp. Attention has also focussed on proper disease identification, winter management, rotation of treatments and discouraging off-label use. Members of CAPA, in cooperation with the Canadian Honey Council, are also pursuing the registration of alternative products for *Varroa* control in Canada.

Other areas of research that CAPA members are currently pursuing include studies of honey bee immunity, honey bee viruses, genetic expression of honey bee responses to disease, the biology of new and emerging bee pests and best management practices to promote the health of colonies.

The impact of *N. ceranae* on honey bees is not clearly understood and it is likely a factor in the survival of colonies already under multiple stresses. Both *N. ceranae* and *N. apis* can be found in Canada which is in contrast to the U.S. where *N. apis* is now seldom found in samples. Changes in the distribution and prevalence of these species will continue to be monitored.

Currently, CAPA members are undertaking research projects to better understand this parasite. Aims include determining the seasonal occurrence of *N. ceranae and N. apis* in Canada, developing strategies for effectively managing these parasites as well as evaluating the use of novel therapeutic agents. Current findings suggest that *N. ceranae* is susceptible to fumagillin, the only registered therapeutic agent against *N. apis*. Nevertheless, much work is needed to determine best management practices to control this organism.

In 2009, the Canadian Pollination Initiative (CANPOLIN) was launched to address the growing problem of pollinator decline in agricultural and natural ecosystems in Canada. This initiative, funded as a five-year NSERC Strategic Network, includes researchers at 26 universities across the country that are working with government agencies, NGO's and industry to deliver critical insights and sustainable solutions to the pollination problem. The Scientific Director of CANPOLIN is CAPA member, Dr. Peter Kevan, of the University of Guelph. Other CAPA researchers comprise key working groups including those on managed pollinators. Refer to the CANPOLIN website for current information: http://www.uoguelph.ca/canpolin/

Recent publications contributed to by CAPA members that discuss wintering losses in Canada and the roles of *Varroa destructor* and *Nosema ceranae* include the following:

van der Zee, R. et al. (2012) Managed honey bee colony losses in Canada, China, Europe, Israel and Turkey, for the winters of 2008-2009 and 2009–2010. *Journal of Apicultural Research. 51(1): 100-114 DOI 10.3896/IBRA.1.51.1.12).*

vanEngelsdorp, D. et al. (2011) Calculating and reporting managed honey bee colony losses, pp. 229-236 *in* Honey Bee Colony Health: Challenges and Sustainable Solutions, Sammataro, D. and Yoder, J.A., CRC Press, Boca Raton FL, 302 pp.

Currie, R.W., Pernal, S.F., Guzmán-Novoa, E. (2010) Honey bee colony losses in Canada. *Journal of Apicultural Research*. 49(1): 104-106.

Guzmán-Novoa, E., Eccles, L., Calvete, Y., McGowan, J., Kelly, P. and Correa-Benitez, A. (2010) *Varroa destructor* is the main culprit for death and reduced populations of overwintered honey bees in Ontario, Canada. *Apidologie* 4(4): 443-451.

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