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Proceedings of

COLOSS WG 1 Workshop Monitoring of colony losses 2011-2012 - temporal and spatial patterns

1-2nd October 2012
Beekeeping Farm "Sądecki Bartnik" A.&J. Kasztelewicz,
33-331 Stróże 235, POLAND

Ricola Foundation Nature & Culture

SĄDECKI BARTNIK®

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09:15 – 10:40	Analysis, including the spatial (random) effects of the 2011 and 2012 international monitoring data by Romée van der Zee and Lennard Pisa
10:40 – 11:00	Coffee break
11:00-11:25	Results of colony loss monitoring in Scotland for winters of 2007-2008 to 2011-2012 (Alison Gray and Magnus Peterson)
11:25-11:50	What to do with the collected data? Multivariate analyses applied in monitoring (Piotr Medrzycki et al)
11:50-12:30	Other national monitoring projects and monitoring results - presentations and discussion.
12:30 – 13:30	Lunch
13:30-14:30	Other national monitoring projects and monitoring results-presentations and discussion (continuation)
14:30-15:30	Evaluation of four year monitoring and discussion of the future collaboration on colony losses
15:30 – 16:00	Coffe break
16:00 – 18:00	Evaluation of four year monitoring and discussion of the future collaboration on colony losses (continuation)
18:30 – open	Evening meal (at the site)
02/10/2012 (Tuesday)	
9:00-11:00	Development of the 2013 questionnaire
11:00 - 11.30	Coffee break
11:30 – 13:00	Development of the 2013 questionnaire (continued)
13:00 – 14:00	Lunch
14:00 - 17:00	Technical tour of the Beekeeping Farm “Sądecki Bartnik”
18:00 – open	Evening meal (at the site) and the end of the workshop

B. ABSTRACTS

Five years of monitoring winter colony losses in Austria

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We are monitoring winter losses of honey bee colonies now 5 consecutive years. In the winter of 2011/12 the highest losses so far (25.9%) were reported by 1537 beekeepers wintering 32471 colonies. Hot spots with high losses were the northern part of Austria, the south-east and Vorarlberg in the west. Colony losses are associated with several risk factors: Location and honey and pollen sources. In contrast to previous years, this year no significant effects were detected for operation size, transport of colonies and honeydew remaining in colonies over winter. Losses can significantly be reduced when drone brood is removed already in April and are significantly higher in operations that did not treat against *Varroa destructor* in July or August. The high number and distribution of responses all over the country allows for further analysis of spatial and climatic factors that are not asked in the COLOSS questionnaire, but can be obtained from other resources.

Changes of the two year COLOSS Questionnaire in Hungary

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For the 2010-2011 Questionnaire was the first year for Hungary to participate in the COLOSS WG1 survey on honeybee colony winter losses. The Hungarian National Sanitary Network was organizing personal inspection for every apiaries two times a year as a regulation for bee health. During these personal visits the sanitary inspectors were asking the beekeepers to fill out the preprinted sheets right away during the field inspection. The beekeepers were not informed about the questionnaire before, the reliance was up to the relationship with their inspector. We have no data that what rate of the beekeepers was cooperating. The completed sheets were sent to our institutes (KATKI and VMI) for keyboarding. The beemonitoring.org was not visited ore used by the beekeepers, all answers were typed by other from paper.

For 2011-2012 Questionnaire the sanitary inspectors were not as motivated as before, because of the delaying payments. Nevertheless the beemonitoring.org website was translated to Hungarian, we had an article about the survey in our national beekeepers journal about it and it was advertised on the website of Hungarian Beekeepers Federation 10% of the answering beekeepers used it. This way we had about the same number of beekeepers answering.

Preliminary analysis of colony losses in Ireland 2011/2012

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Ireland experiences a cool temperate climate with high rainfall even during the Summer months; hence beekeeping in Ireland is practiced mainly as a hobby. It is coordinated by the Federation of Irish Beekeeping Association (FIBKA) with 53 local associations distributed around the country. Today there are approximately 2550 affiliated members, however only 650 have registered with the Department of Agriculture, Food and the Marine (DAFM). In general the number of colonies managed per beekeeper is small. According to a recent census carried out by FIBKA in collaboration with DAFM, approximately 61% of beekeepers manage 1-5 colonies, while <2% have >50 colonies. Since 2008/2009 winter colony losses have been monitored on an annual basis using the standardized COLOSS questionnaire with minor changes. Since <25% are beekeepers are registered with DAFM, the questionnaire cannot be distributed using a totally randomized method, hence we encourage as many beekeepers as possible to participate by distributing the questionnaire in late April using email, meetings, the FIBKA magazine (An Beachaire) and the FIBKA webpage. Close collaboration with secretaries at local level further encourages active participation. A total of 355 beekeepers participated and a preliminary analysis of this year's data estimates losses of approximately 13%, which is lower that experienced during 2010/2011 (17%) or 2009/2010 (24%). Symptoms of CCD were reported by beekeepers, bees were predominantly fed on cane/beet sugar syrup, *Apis mellifera meillifera* is the predominant bee race, queen importation as a means of queen replacement is minimal and *Varroa destructor* is treated during August – October. Assessment of possible correlations between these factors and increased colony losses needs to be carried out.

Experience and evaluation of colony loss monitoring in Scotland: survey methodology, response rates and degree of success

Alison Gray and Magnus Peterson

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Surveys of beekeepers in Scotland have been running since 2006, with Scotland joining COLOSS Working Group 1 in 2010. Since 2008 these surveys have been based on stratified random sampling of the membership records of the Scottish Beekeepers' Association (SBA), and have used a postal questionnaire with a covering letter. The surveys have run in late spring, after a small scale pilot run, and allowing 3 to 4 weeks for response to the main survey. Late returns are accepted and included where possible in the COLOSS return. A small prize draw has been possible in recent surveys as an incentive to participate, and a postal reminder is issued.

The SBA has approximately 1100 members. Sample sizes were 100 beekeepers approached directly in the 2006 survey, 119 SBA members in 2008, and 200 hobbyist SBA members in the 2010 survey (plus 26 bee farmers), 200 SBA members in 2011 and 250 in 2012. Response rates were 77% in 2006, 42.0% (50; 44 beekeepers) in 2008, 68.5% (137, of which 116 were beekeepers; plus 9 bee farmers) in 2010, 47.0% (94; 64 beekeepers) in 2011, and 41.6% (104; 91 beekeepers) in 2012.

Our main observation regarding the success of the questions is that questions relating to bee management lead to illogical results in a large proportion of cases. Our attempts to allow for all possibilities in the answers to these questions have not reduced the incidence of such unreliable results. We therefore use stated colony numbers at the start of winter and stated losses to calculate overall loss rates. As bee management is rare in Scottish winters, this should have little impact on conclusions. Summer losses are very low.

For future surveys, we plan to operate an online questionnaire based on LimeSurvey (http://www.limesurvey.org/), for speed and ease of data collection and lower costs, possibly with a larger scale sample.

Results of colony loss monitoring in Scotland for the winters of 2007-2008 to 2011-2012

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We began surveys of beekeepers in Scotland in 2006, using a geographically stratified approach and postal questionnaires. These have run in 2006, 2008, 2010, 2011 and 2012, with annual surveys beginning in 2010. In 2006 questions on colony loss related to unexplained losses. Since 2008 we have asked about any losses and have used stratified random sampling. We have recently examined winter loss rates based on our strata, using two different broad geographical splits, i.e. North-Central-South and East-West. These are of interest in relation to presence/absence of Varroa infestation, and different forage sources, both of which may have an association with loss rates. For the winters of 2009-2010 onwards, striking and statistically significant differences have been observed between winter loss rates between beekeepers in the east and the west of Scotland. Loss rates in the east are consistently higher. There was no significant difference in loss rates prior to that winter, and it appears that something changed between 2007-2008 and 2009-2010. Differences between the north, central Scotland and the south were not significant. Important management practices such as supplementary feeding going into winter, and Varroa treatment are unlikely to differ systematically between such large scale geographical areas, although they will differ between beekeepers. Considering possible reasons for the observed differences between areas, we are looking for factors that affect all or a large proportion of beekeepers in a given area. In Scotland two factors which have changed in recent years are the growing of Oil Seed Rape and its treatment, and also weather patterns. Examination of winter loss rates amongst beekeepers whose bees forage on OSR and those whose bees do not showed the loss rates in the former group to be significantly higher. The growing of OSR is strongly associated with area, and is much more common in the east of Scotland than the west. Investigation of possible risk factors associated with the different loss rates is ongoing.

Survey on winter losses in Sweden

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Since 2009 we have conducted online surveys on winter losses based on the questionnaires developed by WG1 within the COLOSS network. This year 1448 beekeepers with a total of 22919 colonies October 1st 2011 answered the questionnaire. The total loss was 11,9 % (n=22919). Data from the online survey has been submitted to the chair of WG1 for a joint publication about losses.

In addition to the online survey we sent the questionnaire to 1200 randomly selected members of the Swedish Beekeepers Association (which has approx. 10000 members). We received 505 responses, 29 of the beekeepers who responded didn't have bees and 121 had answered the online questionnaire. The remaining 355 beekeepers had a total of 3326 colonies October 1st 2011. The total loss of those colonies was 12,6%.

From the surveys 2012 we have data from 1803 beekeepers (approx. 15% of the beekeepers in Sweden) who in total had 26245 colonies October 1st 2011 (approx 20% of the colonies in Sweden). The total loss was 12,1%.

What to do with the collected data? Multivariate analyses applied in monitoring

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Generally, all monitoring programs are divided in two big steps: 1) collection of raw data in the monitored area and 2) data interpretation. Both parts are equally important. Nevertheless, while data collection is relatively easy (once the monitoring protocol is defined), the elaboration of the results may be a big effort. This is due to enormous quantity of data belonging to different categories. In this paper, the results of the monitoring of honey bee colonies in the Emilia-Romagna region (Italy) are presented. The program involved 10 apiaries with 10 hives each. The hives were controlled 4 times during the 2010 season. Colony strength was assessed at each visit. Several external parameters regarding land use were also defined. After the winter, colony mortality rates were assessed as well. The raw data were processed with PCA statistics. This method allows to analyze contemporaneously huge quantity of variables characterized by different scales and to individuate apparent correlations between variables. In this particular case we have observed that the bee colony mortality was positively correlated with %vineyards in the apiary surroundings. The %pomaceae, drupaceae and vegetables had no apparent correlation with colony mortality. This indicates that vineyards constitute a stressing factor for honey bee colonies, fact deriving from the intense pesticide treatments against vine pests in this region. It was also evidenced that the spring colony mortality was correlated with the parameters of colony strength but not with the quantity of fresh honey. Thus, this method allows to define which variables may be used as colony survival predictors. In addition, a short overview of a new national monitoring program BEENET, financed by the Italian Ministry of Agriculture, will be presented. This program involves 3750 experimental hives distributed on the whole national territory.

The colony losses monitoring in Poland; winter 2011/2012 results and evaluation of four years survey

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The winter of 20011/2012 was the fourth to be followed by an investigation of honey bee colony losses in Poland, carried out using the Coloss questionnaire.
The estimated winter colony losses in Poland were: in 2007/2008 – 15.3%, 2008/2009 – 11.1%, 2009/2010 – 15.3%, 2010/2011 – 18.1%, 2011/2012 - 15.8%, although in some regions they exceeded even 30%. Generally in 2011/2012 different regions than in the previous year were most affected. No influence of kind of food or source of forage, on colony losses in the last year was observed, however similarly to the previous years, the owners of apiaries of up to 50 hives lost a higher percentage of their colonies than the owners of bigger apiaries.
In 2009-2012 the ways in which the questionnaire was disseminated were extended and after the winter of 2011/2012 the questionnaire was published in the two most popular Polish beekeeping journals, was disseminated during beekeeping meetings and conferences, and its Internet version was accessible on the website www.beemonitoring.org. Besides, invitation letters and next reminders were sent to the beekeepers' e-mail addresses and, at the end, the questionnaire form was posted to randomly selected beekeepers (from the veterinary inspection list) from the five regions in which the participation of beekeepers was very low (free return postage was offered). Despite all our efforts, the participation of beekeepers in the survey was not satisfactory and in the following years (2009-2012) reached: 0.8%, 0.8%, 1.6%, 1.3%. The percentage of beekeepers, who used the questionnaire published in beekeeping journals, was not high. The participation of beekeepers in the Internet survey was also low.
Participation of beekeepers from different regions varied from year to year and was influenced by the dissemination of questionnaires during meetings and conferences and beekeeping associations' involvement. The randomized sampling substantially increased the participation of beekeepers in the regions in which it was applied. The response ratio of the "randomized" sampling was about 34% in general.
In such a big country as Poland, with so many beekeepers and in the face of their low participation in Internet surveys, it is very difficult to obtain a satisfactory survey with non randomized sampling, even if multi-mode data collection is used.

A multilevel analysis of the effect of unexplained local exposure of risk factors and *Varroa destructor* control on international honeybee colony losses 2010-2011 and 2011-2012

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A large number of countries have collected data on colony losses and possibly explaining factors. An analysis will be presented on associations between honey bee colony winter losses and varroa treatment within international regions over 2011 and 2012. Random effects will be calculated and shown on choropleth maps.

Comments on the 2011-12 questionnaire

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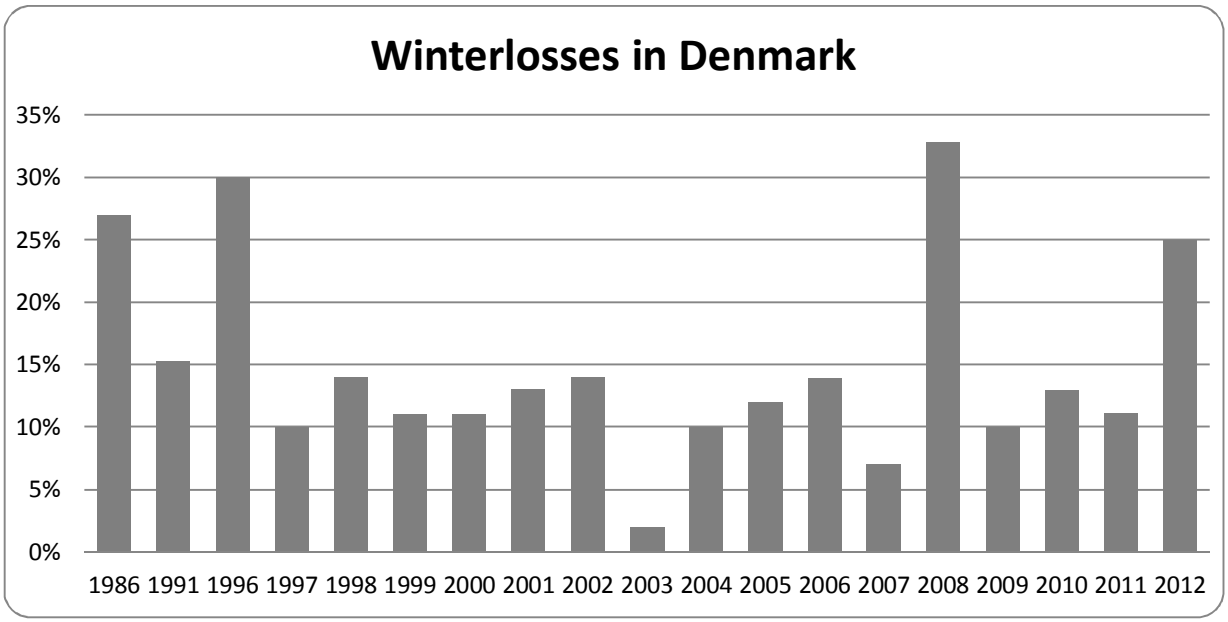
It was found during analyzing the data for the Danish Coloss questionnaire 2012 (980 answers representing 23 % of the members of the Danish Beekeepers Association) that the beekeepers had problems understanding especially the questions 9 and 11 concerning increase and decrease in numbers of colonies.
Calculating the losses from the formula:
Losses = (colonies before winter (3) - decreases (9) + increases (10)) - colonies after winter (11)/(colonies before winter (3)- decreases (9)+increases (10))
It turns out that more then 150 (15%) gave wrong answers, so that they had more colonies in spring than they had wintered in the fall (negative losses of beecolonies during the winter). Calculation of losses not rejecting these answers is 20.8%. Rejecting the answers the losses are 25.0 %. Question 9 also creates a paradox. Calculating the losses from
Losses = (How many of these colonies were lost during winter 2011-12)(4)/How many productions colonies did you have before winter 2011-2012 (3)
does in fact give substantial lower losses 14.2%.
Conclusion: We have to give even better explanation to question 9 and 10 and question 4 has to be removed from the questionnaire for the season 2012-13, not to produce confusion.

Winter losses in Denmark since 1986:



Questions from the Coloss questionnaire 2012

3 How many production colonies did you have before winter 2011-2012?

4 How many of these colonies were lost during winter 2011-2012?

9 What was your reduction in total number of colonies due to merging or selling colonies during winter 2011-2012?

10 How many increases have you made (e. g. splitting or buying colonies) during winter 2011-2012?

11 How many production colonies did you have after; winter 2011-2012

Coloss questionnaire in Spain

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The COLOSS Questionnaires for 2012 were distributed in Spain. Due to the low participation registered in the previous years and following the guidelines agreed during the COLOSS Working Group 1 Workshop (York 2012), we focused on a smaller region of Spain.

We sent the questionnaire to the 1735 beekeepers registered in Castilla –La Mancha (Central Spain) to their postal address to be filled by themselves. At the moment of writing this abstract, a hundred of beekeepers had remitted the filled out questionnaire to our Beekeeping Center (CAR, Marchamalo, Spain). Although participation again was low, it was over the 6%. The number of honey bee colonies managed by beekeepers answering the questionnaire was 13,122 with an average of 130 colonies per beekeeper. The mean percentage of losses was around the 18% and the 54% of them were lost without bees inside the colony.

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