

Scottish Beekeepers' Association Survey 2014 Report

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1 Introduction

1.1 Background

In 2014 the Scottish Beekeepers' Association (SBA) again supported the carrying out of a survey of its members in late spring and early summer in order to continue monitoring the state of beekeeping in Scotland. These surveys began in 2006 and have all been designed and carried out from the University of Strathclyde, with the help of the SBA.

As since 2010, the data from the survey provided the basis of a return from Scotland to the COLOSS organisation (www.coloss.org) which monitors honey-bee colony losses internationally.

1.2 Summary of key findings

Before the detailed description and analysis of the survey which follows, this section states for quick reference some of the key findings of the analysis.

1.2.1 Sampling and response rate

The sample size was 350. The response rate to the electronic questionnaire was 70.3% (180 out of 256) though not all returns were complete, and to the postal questionnaire 35.1% (33 out of 94), similar rates of response to those in the previous year. Of the respondents 87.6% (177 out of 202 answering this question) were active beekeepers during the period covered by the survey.

1.2.2 Sample profile

As in 2013, most beekeepers were over 40 years of age, and more than half were over 50 years of age: the male/female distribution of beekeepers was 64.7% male and 35.3% female of the 173 respondents who provided this information, which is virtually identical to the 2013 results.

It was notable that, although there were many fairly new beekeepers in the sample, not many of these were young. It appears that although increasing numbers of people are taking up beekeeping, the majority of these are middle-aged or older.

1.2.3 Sizes of beekeeping enterprises

One beekeeper stated that he had no main apiary, but most said they had a single apiary. No respondent had more than 6 apiaries, and 89.2% of the 176 respondents to this question had either 1 or 2 apiaries.

In October 2013, only 33 of 170 respondents to this question (19.4%) were managing more than 5 colonies of bees. Most (112 out of 170 — 65.9%) were managing 3 or fewer colonies.

A typical beekeeping member of the Scottish Beekeepers' Association is managing 3 or fewer colonies in a single apiary.

1.2.4 Winter colony losses 2013–14

The over-all reported winter loss rate was 13.5% (97 colonies lost out of 718). This is a far lower rate than that reported for 2012–13 of 31.6%, and is much more typical of winter loss rates reported in other recent years.

1.2.5 Differences in winter loss rates by various criteria

Geographically splitting Scotland into North, Centre and South, the South reported the highest winter loss rate at 20.5%, and the North the lowest at 8.8%. The Centre reported 18.0% loss. These differences are statistically significant. There was no significant difference in reported loss rates between the East and West of Scotland.

There was a highly significant difference in reported loss rates between those beekeepers who said their bees had foraged on Oil Seed Rape (OSR) and those who said they had not. Those on OSR lost 8.6% of colonies (21 out of 244), and those not on OSR lost 15.8% of colonies (63 out of 398).

These differences are in all cases in disagreement with many of our other recent surveys. Usually there has been little difference between the North, the Centre and the South, whereas there have been significantly higher winter loss rates in the East than in the West in several recent years.

Also, higher winter loss rates were reported for bees foraging on OSR in 2011 (30% versus 15% — statistically significant) and in 2012 (20.8% versus 14.3% but not statistically significant), and it was suspected that this might be evidence of a harmful effect of neonicotinoid pesticides used as a seed dressing on OSR. However although these pesticides were still in use for OSR crops in 2013, the difference was reversed in winter loss rates for 2013–14 (as it was also for 21012–13).

1.2.6 Reported causes of winter loss

The most frequently reported cause of winter loss was “Queen Problems” — either a queenless colony or a drone-laying queen, accounting for 53 out of 97 reported causes of loss. Isolation starvation was reported 25 times as a cause of loss. Interestingly no losses were attributed to *Varroa* infestation.

1.2.7 Postal and online respondents

The proportion of members of the SBA without online access continues to shrink. Those without online access are however more likely to be *older*, to be *male*, and to have *more years of experience of beekeeping*. It is still judged worthwhile to keep in touch with them therefore, though the size of their beekeeping enterprises and the loss rates they experience are not significantly different from those with online access.

1.2.8 Bee races being kept

Only 9 of the 177 beekeepers who responded failed to answer the question about what race of bees they were keeping. Of those who answered, 45.8% said they were keeping “local bees of no named type” and 14.9% said they did not know what race they were keeping, so that only about 40% of those who answered claimed to be keeping a named race. Of those answering, 23.2% said they were keeping *Apis mellifera mellifera*, the Northern European Dark Bee, and 10.1% that they were keeping the Buckfast strain. The Italian race *A. mellifera ligustica* and the Carniolan race *A. mellifera carnica* were each claimed by only 3% of those responding.

The reasons given for making these claims of a specific race were in almost 61% of cases “information given by the supplier of the bees” and in 31.2% of cases “the general appearance of the bees”. A wing morphometry test was the basis of 7.8% of the claims but no DNA analysis was reported.

1.2.9 *Varroa* awareness

Beekeepers were asked if they lived in an area where *Varroa* had already been detected. Of those replying, 15 (8.9%) stated that they were in a *Varroa*-free area. Three of these respondents are certainly wrong. The others are perhaps justified in their belief as they were all living in remote areas of Scotland. However all 15 were taking steps to try to detect the presence of *Varroa* if it arrived.

Less satisfactory is the fact that of the 145 beekeepers who acknowledged that *Varroa* was in their area, 18 (12.4%) were taking no steps to monitor levels of infestation. A later question on when monitoring for the level of infestation was carried out, however, indicates that beekeepers monitor for levels of infestation about twice per year on average.

1.2.10 *Varroa* control

Only two biotechnical control methods are widely applied. The first is removal of drone brood, reported as being used on 71 occasions, but naturally always in spring/summer. The other was “dusting with icing sugar”, mentioned 7 times as an “other” biotechnical method.

Thirteen possible chemical control substances were suggested, and 111 of the beekeepers (62.7%) said they used at least one, with 31 (17.5%) saying they did not. There were 35 beekeepers who did not answer this question.

The most frequently used of these substances was oxalic acid by the trickle method (63 uses) and various Thymol preparations (49 uses). Amitraz as Apivar strips was used 44 times and formic acid in some form 40 times. Use of both Apistan (19 uses) and Bayvarol (5 uses) has declined, no doubt because of reports of resistant mites.

Most chemical controls are applied in early autumn, with a mid-winter peak for oxalic acid and a smaller peak in spring when formic acid predominates.

Open mesh floors continue to be a widely used control measure (84.4% of beekeepers answering this question used them).

1.2.11 Migratory beekeeping

Migration of bees continues to be at a low level. Only 23 beekeepers (13.9% of those responding) said they moved any colonies. Perhaps the continuing outbreaks of Foulbrood disease are making more beekeepers reluctant to move their bees. Possibly many small-scale beekeepers do not have the time available to manage moving bees.

1.2.12 Forage crops

Beekeepers were asked to specify from a list the flowers their bees foraged on. The six most frequently cited were Dandelion (135), Rosebay willow-herb (111), Top fruit (apple, pear etc) (106), Willow (106), Clover (105), and Ivy (92).

1.2.13 Percentage of brood comb renewed

It is nowadays recommended practice to renew a proportion of brood comb on a regular basis to prevent the build-up of various pathogens. Only 160 of the 177 beekeepers answered this question, and of these 53, or just over one-third, stated that they did not regularly renew any brood comb. The median percentage of regular renewal was 10%, but the levels claimed were very variable indeed. There is certainly little uniformity of practice about this management tool.

1.3 Design of the survey

In 2014 for the second year an electronic questionnaire was used, designed with the package LimeSurvey and administered using email addresses of SBA members when these were available. Again this provided much quicker and easier data entry both for those administering the survey and also for those responding to it. It is also much cheaper to run, as postal costs are greatly reduced.

Again the decision was taken to include members of the SBA who do not make use of email to participate, so a limited number of SBA members with no email addresses known to the SBA membership secretary were also approached by post, the results of the two sets of responses being combined for the analysis below. Those in our selected sample with no email address provided formed the bulk of those receiving the postal questionnaires, but as last year, a number of the email addresses provided to us were found not to be valid. These were added to the postal element of the sample, so in the event this was a slightly larger proportion of the sample than originally anticipated.

The ease of sending out reminders to those being approached by email again ensured that at least for that portion of the survey a fairly high response rate was achieved.

A Neyman allocation scheme (using the winter 2012–2013 overall loss rates per area) was used to divide the chosen sample size of 350 between the main SBA administrative areas, namely Aberdeen and the North combined, the East and the West. These samples were then subdivided in proportion to the SBA membership in the smaller geographical sub-areas that were also used in the previous recent surveys. Orkney, Shetland and the Outer Hebrides were included in the North Far-North sub-area, and the Inner Hebrides were included in the North North-West. The details are in Table 1.

Once more we offered a prize to be competed for by those responding. As in the last few surveys this was kindly provided by Thornes, Beekeeping Equipment Suppliers of Wragby and Newburgh. We are grateful to Thornes for their generous ongoing support of these surveys.

Area	No. of members	No. sampled	Sub-region	Size	No. sampled
Aberdeen	92	27		92	27
East	595	159	East-Central	439	117
			North-East	98	26
			South-East	58	16
North	228	66	Far-North	73	21
			Inverness & surrounding area	94	27
			North-West	61	18
West	309	98	South-West	150	48
			West-Central	159	50
Total	1224	350			350

Table 1: Details of the survey design

2 The Questionnaire used

Little change was made to the format of the questionnaire this year as compared with that in 2013. There was some further simplification, and in particular it was decided (along with the decision of COLOSS) not to investigate summer losses this year. This is because the usual splitting of colonies — not always successfully — can lead to very confusing and apparently contradictory reporting, so that these questions have yielded very little useful information. The increases and decreases made in winter were also omitted, since for most beekeepers in Scotland, as in most Northern Hemisphere countries, very little of this takes place.

Less detail was also sought about queen replacement, for similar reasons. The only question asked in this area this year was whether the respondent felt that queen problems were at a higher or lower level than normal in 2013–14, or were within the normal range.

The questions on migratory beekeeping were also much simplified. Members of the SBA are hardly ever involved in pollination contracts, as this activity is at present largely confined to full-time bee farmers who are not included in this survey. So only the level of participation in any migratory beekeeping (for pollination or honey production) was asked about. Much of the soft fruit now grown in Scotland is grown under poly-tunnels, and the pollination of crops grown in this way is increasingly being brought about by commercially produced colonies of bumble-bees, so that the demand in Scotland for honey-bees for pollination of soft fruit is now greatly reduced.

One further question included this year was whether any particular questions had been hard to answer.

The postal version of the full final questionnaire used is included as an appendix to this report. The on-line version matches this as closely as is feasible, and is available for anyone interested to see it.

The LimeSurvey questionnaire package encourages the grouping of questions as we have already done. Because some of last year’s question groups were omitted this time, the letters for the groups of questions in the 2014 questionnaire are not strictly sequential, as some letters have been omitted.

The groups used this time were:–

- A Preliminary questions and Beekeeper Profile.
- B Beekeeping activities introduction.
- C Beekeeping activities 2013 spring colonies.
- F Beekeeping activities — colonies in October 2013.
- G Post winter 2013–14.
- I Spring 2013 colonies.

- J Bee races being kept.
- K Extent of queen problems.
- L Varroa awareness.
- M Varroa control.
- N Migratory beekeeping.
- O Forage crops.
- P Management issues.
- Q Final (for free format comments).
- R Optional contact details.

We have found in the last two years that leaving the (optional) provision of contact details to the end of the questionnaire has led to a larger proportion of respondents choosing to remain anonymous, which is slightly inconvenient for us. Hence we plan if the survey runs again in 2015 to restore this to the start of the questionnaire where it used to be.

As last year, the main body of the report will be arranged in sections following this arrangement for the most part, though with some deviations where these are appropriate.

3 Going through the questionnaire

3.1 Preliminary Questions

3.1.1 The response rate

The total numbers of electronic and postal questionnaires issued and returned along with the response rates are summarised in Table 2.

	Electronic	Postal	Total
Sent out	256*	94*	350*
Completed	149	33	182
Partially completed	31	0	31
Opted out	9	0	9
Not returned	87	61	148
Response rate (fully completed returns)	58.2%	35.1%	52.0%
Response rate (all returns)	70.3%	35.1%	60.9%

Table 2: Responses to the survey

* Note that the original intention was for 273 electronic and 77 postal, but 17 email addresses failed, so postal questionnaires were also sent to these additional 17 SBA members.

The response rate to the electronic questionnaires of 70.3% is fairly satisfactory, though only 58.2% were fully completed. As in previous years, the response to the postal questionnaires was lower at 35.1%, though once again only a single reminder was sent out to postal respondents owing to the high cost of postal reminders.

The over-all response rate of almost 61% is comparable with what was achieved last year.

3.1.2 Beekeepers and non-beekeepers

As in previous years, not all those approached were active beekeepers during the period being surveyed. It is not currently possible to identify active beekeepers before selecting the SBA members to invite to participate in the survey. The results are summarised in Table 3. Of the 213 respondents to the survey, 202 answered the question on this, and of these 177 (87.6%) were active beekeepers.

In contrast to the 2013 survey reporting on beekeepers in 2012–13 when 50% of the postal respondents were non-beekeepers as opposed to only 21.3% among the on-line respondents, almost the same proportion of postal respondents as electronic respondents claimed to be beekeepers in 2013–14.

	Electronic	Postal	Total
Beekeepers	148	29	177
Non-beekeepers	21	4	25
No Response	11	0	11
Percentage keeping bees**	87.6%	87.9%	87.6%

Table 3: Beekeepers and non-beekeepers

** The dates applied were between April 1st 2013 and May 1st 2014.

3.1.3 The non-beekeepers

The non-beekeepers were asked

- (a) whether they were interested in becoming beekeepers, and
- (b) whether they had previously been beekeepers.

The results are summarised in Table 4.

	Electronic			Postal			Total		
Total numbers	21			4			25		
	Yes	No	No response	Yes	No	No response	Yes	No	No response
Interested?	16	2	3	4	0	0	20	6	3
Percentages	88.9	11.1		100.0	0.0		76.9	23.1	
Previous beekeeper?	7	12	2	3	1	0	10	13	2
Percentages	36.8	63.2		75.0	25.0		43.5	56.5	

Table 4: Characteristics of the non-beekeepers

The striking feature of this table in 2014 is the high proportion of all such respondents who wish to become beekeepers in future. Evidently this applies both to those who have and those who have not previously been beekeepers.

Widely reported difficulties in satisfying the demand for bees for prospective beekeepers may well be reflected here.

3.1.4 Ages and sexes of respondents

All beekeeping respondents were asked to give their age group and their sex (F (Female) or M (Male)). Ages were in 7 groups. Respondents could choose not to respond to these questions. The results are summarised in Table 5.

Age Group	No sex given	F	M	Total
Undeclared	2	0	1	3
Under 20	0	0	1	1
20–29	0	1	0	1
30–39	0	5	4	9
40–49	0	10	14	24
50–59	0	17	25	42
60–69	1	19	26	46
70 or over	1	9	41	51
Total	4	61	112	177

Table 5: Distribution of age group and sex of beekeepers

As in 2013, the great majority of beekeepers are aged over 40 and more than half of them are over 50. Although ages are grouped, the best estimate of their mean (average) age is 50.3 years and the best estimate of their median (typical) age is 54.5 years.

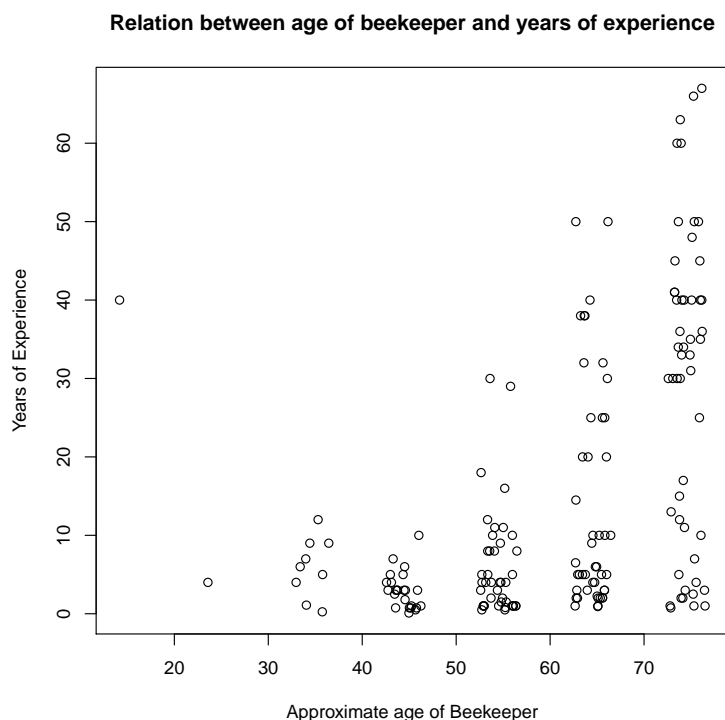


Figure 1: Relation between ages of beekeepers and years of experience

This general picture of the age of new beekeepers in 2014 is supported by Figure 1 where their stated years of experience of beekeeping are plotted against the approximate ages of respondents. Many, even of the older beekeepers, have limited experience and so are relative newcomers to beekeeping. The large number of older beekeepers with few years of experience reflects the many new entrants to beekeeping, and it is evident that young people at present are not being attracted in large numbers into beekeeping, but that many middle-aged and older people are taking it up.

Of the 177 beekeepers in our sample, 112 (63.3%) stated they were male, 61 (34.5%) stated they were female and 4 (2.3%) with-held any answer to this question. Of those responding, 64.7% were male and 35.3% were female.

The remaining analysis relates to these 177 beekeepers.

3.2 Beekeeping Activities — Introduction

3.2.1 Size and location of beekeeping enterprises

Beekeepers were asked the number of apiaries for which they had primary responsibility. The distribution of answers is shown in Table 6. The maximum number of apiaries was 6.

Number of apiaries	No response	0	1	2	3	4	5	6	Total
Frequency	1	1	131	26	12	2	3	1	177
Percentage	0.6	0.6	74.0	14.7	6.8	1.1	1.7	0.6	100.0

Table 6: Number of apiaries which the beekeeper looks after

Just 1 beekeeper claimed to be without a main apiary. As in every previous survey, the most frequent response (74.0%) was to claim a single apiary, and only 10.7% stated that they had more than 2 apiaries.

The next question asked beekeepers whether, if they had more than 1 apiary, they kept all their bees within 9 miles (about 15 km) of each other. The results are summarised in Table 7.

	Yes	No	No Response or only had 1 apiary
Numbers	31	13	133
Percentages	70.5%	29.5%	–

Table 7: Are all your bees within 9 miles (15 km) of your main apiary?

This table shows that of all the beekeepers with more than 1 apiary, 70.5% had all their bees within 15 km of their main apiary.

However if the question of interest is what proportion beekeepers over-all keep their bees within a small area we should include among those responding “Yes” to this last question also all those beekeepers who only have 1 apiary. The results are summarised in Table 8. From this it is clear that the overwhelming majority of all the beekeepers (91.5%) keep their bees in an area within 15 km of their main apiary.

	Yes	No	No Response
Numbers	162	13	2
Percentages	91.5%	7.3%	1.1%

Table 8: Are all your bees within 9 miles (15 km) of each other or have you only one apiary?

Beekeepers were asked to give an indication of the location of their principal apiary. Only 10 of the 177 beekeeper respondents failed to give an adequate indication. As in 2013, these locations have all been converted to short postcodes, and from these the geographical spread of the apiaries of the respondents have been partitioned in various ways. Table 9 below shows the frequencies with which different regions feature in three different ways of breaking down the geography of Scotland.

SBA Areas				
Aberdeen and Moray Area	East Area	North Area	West Area	Total
18	73	36	40	167
Northern, Central and Southern				
	Northern	Central	Southern	Total
	59	77	31	167
Eastern and Western				
	Eastern	Western	Unclassified	Total
	107	57	3	167

Table 9: Locations of apiaries (a) by SBA area, (b) by Northern, Central, Southern, (c) by East and West

The first way uses the SBA’s administrative areas of the North Region, Aberdeen and Moray Region, East Region and West Region. The second way divides Scotland arbitrarily into Northern, Central and Southern, using as division lines approximately a line from the Firth of Tay to Oban to separate Northern from Central, and another approximately from the Firth of Forth to the Firth of Clyde to separate Central from Southern. The third way separates Scotland into Eastern and Western, using the SBA’s East or West regions where possible to classify the southern part of the country, and a line roughly from Fort Augustus to Tongue to divide the northern part of the country into East and West. Orkney and Shetland apiaries are omitted from this division, since they cannot sensibly be classified as either East or West.

3.2.2 Colony numbers

As some further idea of the sizes of the beekeeping enterprises being analysed, the beekeepers were asked to state how many colonies they were managing at 3 distinct time-points, namely 2013 April 1st, 2013 October 1st and 2014 April 1st. Table 10 summarises that information for all those three time-points.

Colony Numbers	Beekeepers keeping these numbers on		
	Apr 1 2013	Oct 1 2013	Apr 1 2014
0	32	9	14
1	36	41	49
2	33	36	32
3	17	26	23
4	11	10	8
5	11	15	11
6	5	6	6
7	3	2	3
8	1	4	2
9	2	0	0
10	4	3	4
11	1	1	3
12	6	2	5
13	0	4	1
14	3	2	2
15	1	2	0
16	1	1	0
17	0	0	2
18	0	1	0
19	0	0	1
20	1	2	1
21	0	1	0
22	0	1	0
34	0	0	1
35	2	0	0
37	0	0	1
40	0	1	0
Totals	170	170	169

Table 10: Numbers of colonies being managed at three different dates

Seven of the 177 beekeepers failed to answer this question for two of these dates and eight for the third one, perhaps because it was hard to remember the answers. Only 30 of those who responded were keeping more than 5 colonies at the first date, and more than half of those responding were keeping no more than 2 colonies, so that the median (typical) number of stocks being kept at this date was 2. This distribution is very similar to those obtained in all our earlier surveys, so this confirms again that the great majority of beekeeping SBA members are beekeeping on a very small scale.

No fewer than 32 of those claiming to be beekeepers had no bees at all in April 2013. Almost certainly this supports what the survey of 2013 showed, namely that the winter of 2012–13 was one of the worst beekeeping winters ever experienced in Scotland. By the end of the summer of 2013, the number of beekeepers in this position had come down to 9 (Table 10).

3.3 Colonies in autumn 2013, and changes of colony numbers over the winter of 2013–14

3.3.1 The number of colonies being kept in October 2013

In order to determine the rate of loss experienced over the winter season by those responding to the survey, beekeepers were asked how many colonies each was managing in October 2013. The total number of reported

colonies was 720. Again the distribution of those numbers among the different sizes of operations is summarised in Table 10. Note that, as for April 2013, only 170 of the beekeeper respondents gave information on this, and 9 of these in fact had no bees at 1st October 2013. Fewer than half the beekeepers had more than 2 colonies and more than 5 was not common.

3.3.2 Colony losses during the winter of 2013–14

As always with these surveys, one of the main points of interest is the loss rate experienced during the winter season covered by the survey.

There were 160 of the 177 beekeeper respondents to the survey with “valid” winter loss data. These are beekeepers with a stated number of colonies in October that was at least 1, and a stated total number of winter losses that was no larger than the number of colonies kept going into winter. Also, anyone not providing a total number of losses was omitted from this part of the analysis.

The overall loss rate for these beekeepers was 13.5% of colonies wintered (97 colonies reported as lost from 718 colonies in total being managed in October 2013), and 55 of the 160 beekeepers (34.4%) experienced winter colony losses. This is far lower compared to the winter of 2012–13 when 56.5% of beekeepers reported losses and the overall loss rate was 31.6%.

The different reported causes of loss over winter 2013–14 are summarised in Table 11. The sum of the total numbers reported for each cause exceeds the total reported number of lost colonies (97), because some beekeepers reported losses due to multiple causes.

Reported cause	Number of lost colonies
Starvation	13
Isolation starvation	25
Colony depopulation syndrome	18
Queen problems	53
Loss due to <i>Varroa</i>	0
Losses due to other known causes	18
Losses due to unknown causes	17
Total winter losses	97

Table 11: Reported causes of loss of colonies during winter 2013–14

The most commonly reported cause of winter loss was Queen Problems. This high rate of Queen Problems, as in the 2013 survey, has been attributed by many beekeepers to poor mating conditions for queens during the immediately preceding summer, so that many of that summer’s queens were not adequately mated, and became drone-layers over the winter. Isolation starvation again featured frequently in the list of causes of loss, though less prominently than in 2013. It is interesting to note that none of the winter losses was attributed to *Varroa* infestation.

The “Losses due to other known causes” are summarised in Table 12.

Reported cause	No. of colonies lost	No. of beekeepers involved
Hive blown over in a gale	1	1
Colony too small	4	4
Food available, no dead bees, just gone	1	1
Nosema	2	2
Nosema or dysentery	1	1
Dysentery	1	1
Queen Problem	6	5
Robbing	1	1

Table 12: Other known causes of loss during winter 2013–14

Many of these stated “new” causes (e.g., “Queen Problems”) could well have been included among the suggested known causes in the questionnaire. The three exceptions are “blowing over of a hive in a gale”, and

“robbing”, each of which occurred in a single instance, as well as the 4 cases in which a colony was judged “too small” to have survived the winter.

It would probably be reasonable to include all the cases reported here as “Nosema” or “dysentery” under a single heading of “dysentery”, which is of course already in the main list, although it was not chosen by any of the respondents.

Differential winter loss rates by various criteria

In the last few surveys we have also analysed the differences in reported loss rates from different areas of Scotland and also between those colonies reported as foraging on Oil Seed Rape and those not foraging on that crop. Below are the results of those investigations, which in 2014 again produced several surprises.

- **Differences in winter loss rates between the North, Centre and South of Scotland**

The different loss rates reported over the winter for beekeepers in the North, Centre and South of Scotland are summarised in Table 13.

Area	North	Central	South
Colonies Oct 2013	322	244	132
Winter losses reported	25	44	27
Loss rates	8.8%	18.0%	20.5%

Table 13: North, Centre, South winter loss rates 2013–14

The reported differences here are highly significant (p -value for Fisher’s Exact Test $< 10^{-5}$). A significant difference was also found in the winter of 2012–13, though in that winter the area with the lowest loss rate was the South Area with the Central Area having the highest loss rate.

- **Differences in winter loss rates between the East and West of Scotland**

The different loss rates reported over the winter for beekeepers in the East and West of Scotland are summarised in Table 14.

Area	East	West
Colonies Oct 2013	433	248
Winter losses reported	54	40
Loss rates	12.5%	16.1%

Table 14: East and West winter loss rates 2013–14

The reported difference here is not statistically significant (p -value = 0.20 for Fisher’s Exact Test which is greater than 0.05). This contrasts with other recent years prior to 2012–13, for which significantly higher loss rates were reported from the East than from the West. But in 2012–13 there was no significant difference noted. It is interesting to note that though the difference is not significant in 2013–14, as in 2012–13 the higher loss rate was reported from the West, and in contrast to other recent years where the higher loss rate was reported from the East.

- **Differences in winter loss rates between colonies foraging and not foraging on Oil Seed Rape**

The different loss rates reported over the winter for beekeepers whose bees had foraged on Oil Seed Rape, as contrasted with those not foraging on this source, are summarised in Table 15.

Area	OSR	No OSR
Colonies Oct 2013	244	398
Winter losses reported	21	63
Loss rates	8.6%	15.8%

Table 15: OSR vs No OSR winter loss rates for winter 2013–14

The reported difference here is highly significant (p -value for Fisher’s Exact Test = 0.008). Once again this is in line with what was found for the winter of 2012–13, and in complete contrast to what was found in other recent years where the difference was in the opposite direction. Since the time period in question is before the current ban on the use of neonicotinoid pesticides was in place, the difference cannot be attributed to the cessation of use of those pesticides.

- **Differences in winter loss rates between colonies being managed in large-scale and small-scale enterprises**

There has been some evidence from other sources that large-scale, and perhaps therefore better-managed or more established beekeeping enterprises, have higher over-all winter survival rates than small-scale enterprises. We have in 2014 for the first time attempted to investigate this. It is necessary to select a cut-off point between large-scale and small-scale enterprises, and since as remarked earlier, comparatively few respondents are managing more than 5 stocks of bees, that cut-off was chosen so that all those managing more than 5 stocks in October 2013 are treated as larger-scale enterprises, and all others as small-scale.

The different loss rates reported over the winter for these two classes are summarised in Table 16.

Type	Large-Scale	Small-scale
Colonies Oct 2013	414	304
Numbers of beekeepers	33	137
Winter losses reported	48	49
Loss rates	11.6%	16.1%

Table 16: Loss rates for large-scale (more than 5 stocks) enterprises vs small-scale enterprises

The results here do suggest that large-scale operations have a lower over-all winter loss rate, but the difference in the loss rates is not great enough to be statistically significant (p -value = 0.097 for Fisher’s Exact Test which is greater than 0.05).

Colony numbers in April 2014

Finally to round off this section, beekeepers were asked how many stocks they were managing on April 1st in 2014. The total number reported for all beekeepers was 660.

The distribution of these numbers is also detailed in Table 10. Note that even over this much easier winter than that of 2012–13, 14 beekeepers still had no bees after winter and, of these, 12 had lost all their bees over the winter.

3.4 Comparing postal and online respondents in various ways

The proportion of SBA members who are not accessible on-line continues to shrink as the years go by. Now that it has become possible to conduct our surveys on-line, leading to much less expense and greater ease in processing the data, it is important for us to monitor whether it continues to be useful to include a postal survey for those members who do not have working email addresses available from the SBA’s membership list.

Last year quite substantial differences were noted between the two sets of respondents. This section addresses the same question for the 2014 survey.

3.4.1 Comparing winter loss rates for postal and online respondents

In this section we compare the winter loss rates experienced by respondents using the online questionnaire and those submitting a postal questionnaire.

There were 213 responses in total, 33 responses from the postal questionnaires and 180 responses from the online survey. Of these 213 respondents, 177 (83.1%) were beekeepers, 29 of whom were postal participants and 148 were online participants.

Of the 160 beekeeper respondents with “valid” winter loss data, 132 (82.5%) responded online and 28 (17.5%) by post. All of the postal respondents provided valid winter loss data, having no more stated winter losses than colonies going into winter at the start of October.

	Online	Postal	Total
Losses	83	14	97
Survivals	515	106	621
Total	598	120	718
Loss Rates	13.9%	11.7%	13.5%

Table 17: Winter losses for online and postal respondents

Table 17 shows the number of colonies lost over winter and the number surviving, for the online and postal respondents and overall.

The difference between the winter loss rates for online and postal respondents is not statistically significant (p -value for Fisher’s Exact Test is 0.66 which is greater than 0.05).

This contrasts with what was found in the 2013 survey when this difference was found to be significant.

3.4.2 Other systematic differences between online and postal respondents

The criteria examined here are possible differences in levels of experience, in sizes of beekeeping enterprises, in age and also in gender distribution. We might expect those who are not yet accessible on-line to be older, and so to have more years of experience in beekeeping, perhaps to have had confidence to expand their beekeeping enterprises, and perhaps also to be biased in some way in their gender distribution.

In 2013 the size of beekeeping enterprise was judged by numbers of apiaries being managed. However no significant difference was found. In 2014 we have instead examined the size of enterprise by the numbers of colonies being kept in October 2013.

Rather than focussing on just those beekeeper respondents who had provided “valid” winter loss data, all respondents were considered in this exploration, since we are focussing on systematic sampling bias that might be produced by omitting those not accessible online. Clearly years of experience in beekeeping and size of beekeeping enterprise must be evaluated only for those respondents who are beekeepers.

The results for all but the gender differences are shown in Table 18, which gives a summary for Years of Experience and Size of Enterprise, including the minimum, maximum, lower quartile (1st Qu.) and upper quartile (3rd Qu.) as well as the median and mean.

Criterion		Statistic					
		Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
Experience	Online	0.10	2.00	4.50	11.92	15.25	67.00
	Postal	0.50	9.25	25.00	26.84	40.75	66.00
		p -value for Wilcoxon-Mann-Whitney 2-sided test $< 1 \times 10^{-4}$					
No. of Colonies in October 2013	Online	0	1	2	4.255	5	40
	Postal	0	2	3	4.138	5	20
		p -value for Wilcoxon-Mann-Whitney 2-sided test 0.443					

Age Group	10–39	40–49	50–59	60–69	70 or over	No Response
Online	10 (6.9%)	22 (15.2%)	39 (26.9%)	40 (27.6%)	34 (23.4%)	3
Postal	1 (3.4%)	2 (6.9%)	3 (10.3%)	6 (20.7%)	17 (58.6%)	0
p -value for Fisher’s Exact Test 0.03						

Table 18: Various criteria comparing online and postal responses

For the criteria of Experience and Number of Colonies the two different distributions were tested for difference of location using the Wilcoxon-Mann-Whitney test. There is a highly significant difference in Experience with the postal respondents tending to be much more experienced, as expected. However there is no significant difference between the groups in the sizes of their beekeeping enterprises, as measured by the numbers of colonies they were managing in October 2013.

The difference in distribution among the Age Groups presented in the questionnaire was tested using Fisher’s Exact Test, and again there is a significant difference with Postal respondents tending to be older. The table

shows the number and the percentage of each Age Group for Online and for Postal respondents. Note that the first three Age Groups have been amalgamated because there were so few in the lower age groups.

Finally, there are proportionally more females among the online respondents (Table 19). Here we have omitted those who did not disclose their gender from the analysis. This finding corresponds to there being more females as a proportion of the younger age groups of beekeepers than in the older groups.

	Online		Postal	
	F	M	F	M
Frequency	56	88	5	25
%	38.9	61.1	16.7	83.3

Table 19: Gender distribution for postal and online respondents

The differences in proportions here are statistically significant. The p -value for Fisher’s Exact Test is 0.02.

In summary, the postal respondents tend to be older males, and more experienced in beekeeping than the online respondents which is not unexpected.

3.5 Bee Races being kept

As in 2013 beekeepers were asked which, if any, particular race of bee they were keeping.

The answers to the first question are summarised in Table 20. Note that 9 beekeepers failed to answer this question. Most claimed to be keeping a local strain of bee of no named race (77 respondents).

The next most commonly claimed was *Apis mellifera mellifera* (the Northern European black bee) claimed by 39, and 17 beekeepers claimed to keep the Buckfast bee. This year only 25 beekeepers claimed not to know what race they were keeping. None claimed to be keeping “another named race”.

Race reported	Number claiming this	%
Local strain of no named type	77	45.8
<i>Apis mellifera mellifera</i> (N. European black bee)	39	23.2
<i>Apis mellifera carnica</i> (the Carniolan race)	5	3.0
<i>Apis mellifera ligustica</i> (the Italian race)	5	3.0
The “Buckfast” strain	17	10.1
Any other named race	0	0.0
Don’t know	25	14.9
Number responding	168	100.0

Table 20: The races of honey-bees the beekeepers believe they are keeping

Again, as in 2013, those who were claiming to keep a named race of bees were asked upon what grounds they based this claim, with the options shown in Table 21 below.

Basis of claim	Number claiming this	%
General appearance of the bees	20	31.2
What I was told by the supplier	39	60.9
A wing morphometry test	5	7.8
A genetic analysis of the DNA of the bees	0	0.0
Number responding	64	100

Table 21: The grounds on which beekeepers claimed to be keeping a particular race

Only 64 beekeepers answered this question. Most of them responded that they relied on the appearance of their bees or on what they had been told by the supplier of their bees. It is again possible that many of the claimed “black bee” colonies, and other racial claims, are in fact for hybridised bees.

3.6 Extent of queen problems

Only one question was asked about this topic in 2014. That was to what extent queen problems were observed in the beekeeper’s colonies in 2013: higher than normal, normal, or lower than normal, with the option of “Don’t know” also allowed.

The responses are summarised in Table 22.

Extent	Number	%
Higher than normal	27	16.1
Normal	77	45.8
Lower than normal	15	8.9
Don’t know	49	29.2
No response	9	–
Totals	168	100.0

Table 22: The extent of queen problems observed in 2013

Of the beekeepers, 9 failed to respond to this question, and 49 responded “Don’t know” — almost one-third of the responses. The most frequent response from those prepared to commit themselves was “Normal”, though rather more opted for “Higher than normal” than for “Lower than normal”. This is interesting in view of the frequent claim that the most frequently occurring cause of winter loss in 2013–14 was “Queen problems”. Evidently many beekeepers accept that this is a very frequent cause of colony loss in winter.

3.7 *Varroa*

3.7.1 *Varroa* awareness

As a result of the 2013 survey it was discovered that among many beekeepers there is still an unrealistic failure to accept how widespread within Scotland the problem of *Varroa* infestation has become. It was therefore felt important to continue to ask questions to determine whether the ongoing efforts of the SBA and the Bee Inspectorate to educate the beekeeping community about this are improving the level of awareness of this problem among SBA members.

First, beekeepers were asked whether they believed that the *Varroa* mite was present in most bee stocks in their area. Of the 168 respondents to this question, 145 (86.3%) believed that the *Varroa* mite was present and 15 (8.9%) did not. Only 8 claimed not to know.

All 15 of those who did not believe it was present were however taking at least some step in order to check whether *Varroa* was in their stocks. This is a much more satisfactory set of responses than that received in 2013, when 5 out of the 15 respondents then stated that they believed *Varroa* was not present in most stocks in their area but were not taking any steps to detect its presence in their own stocks.

The details of how frequently different detection methods were deployed are given in Table 23. The reason why there are more than 15 instances of methods being used is that some beekeepers used more than one method.

The “Other” detection methods being used were all variations on the theme of examining uncapped drone brood for *Varroa*.

Steps taken	Number doing this
Sent floor scrapings to SASA	5
Personally examined floor scrapings	12
Other	5
None	0

Table 23: Approaches used to detect *Varroa*

An indication of the areas where these 15 respondents’ main apiary is located is given in Table 24, from which it is clear that 3 of these are certainly in areas where *Varroa* is rife. The others have reasonable justification in still believing that their areas are *Varroa*-free, although the detection of *Varroa* in stocks in Halkirk in Caithness in

the summer of 2014 probably means that unfortunately 2 more of these beekeepers will soon lose their *Varroa*-free status (as noted in the table).

Short Postcode	Area	Number	<i>Varroa</i> -free?	Comment
EH27	West Lothian	1	No	
HR6	Hereford and Worcester	1	No	Not in Scotland!
IV27	North-west Sutherland	4	Perhaps	
IV44	Skye	1	Perhaps	
KW1	Wick area	1	Probably no longer	
KW15	Orkney	2	Perhaps	
KW17	Orkney	1	Perhaps	
KW7	South Caithness	1	Probably no longer	
PH33	Fort William	2	Perhaps	
TD9	Hawick	1	No	

Table 24: Approximate location of main apiary for beekeepers unaware of *Varroa* in their area

Unfortunately at this stage, one beekeeper, recorded as being in the Dundee area, was found to be keeping bees in England, probably having moved there.

Of the 145 beekeepers who did believe that *Varroa* was in their area, 18 (12.4%) did not monitor the levels of *Varroa* infestation in their own bees. This is unfortunate, as monitoring is necessary for timely use of *Varroa* control measures, both to ensure control measures are applied when they are needed and also to ensure they are not used unnecessarily.

For those who did monitor, most calculated daily natural mite drop. The full details are in Table 25. Again the reason the total is greater than 145 is because many beekeepers used more than one method of monitoring.

Monitoring method	Number of beekeepers
Calculating daily natural mite drop	103
Uncapping sealed drone brood	57
Other	16

Table 25: Method for monitoring level of *Varroa* infestation

The “Other” methods mentioned are listed in Table 26. They are rather mixed, and are either variations on methods already listed, or sometimes are methods of control rather than of monitoring. Monitoring by looking for signs of damage to bees (DWV etc) are to our minds leaving the situation to get into a state where the recovery of the colony might well be doubtful before any effort at control is made. Also it is our experience that it is only when infestation levels are already unacceptably high that the presence of mites on adult bees can be seen.

Other Monitoring method	Number of beekeepers
Monitoring mite drop without calculating daily drop rate	2
VarroaGuard powdering	1
Oxalic acid, Apilife Var, Varroa mesh floor, Dusting of icing sugar	1
Dusting with icing sugar	2
Sent away floor scrapings for analysis	2
Varroa board - Counting mite drop over a few days	1
Make photos during hive inspection to monitor presence of <i>Varroa</i> on adult bees	1
Checking mite drop fortnightly	1
Checking mite drop after any treatment, Looking out for damaged brood	1
Noting any signs of DWV, or any mites on adult bees.	2
Icing sugar dusting, “Hive Clean”	1

Table 26: Other methods used for monitoring level of *Varroa* infestation

Year when <i>Varroa</i> first found	Number of beekeepers
Before 2013	103
In 2013	27
In 2014	4
<i>Varroa</i> not yet detected	33

Table 27: Year when *Varroa* was first found in colonies

Table 27 shows the year when *Varroa* was first found in beekeepers' colonies. Only 167 beekeepers answered this question. For most beekeepers this was before 2013, however 33 claimed that they had not yet detected *Varroa* in their bees. This figure however can be expected to include newcomers to beekeeping, who may simply not yet have had enough time or gained enough experience to detect the mite.

3.7.2 *Varroa* Control

Four main questions were asked about *Varroa* control:-

20. Could you please indicate in what month and year you monitored and/or started every biotechnical varroa treatment of your production colonies during the period April 2013 – April 2014?
22. Have you used a chemical control against *Varroa* during the period April 2013 - April 2014?
23. Do you apply any chemical method of *Varroa* control to your bees?
25. Do you use open mesh floors on most of your hives as a measure against *Varroa*?

In addition there were sub-questions 21. and 24. to 20. and to 23. respectively, seeking more detail from respondents who did use the methods of control described in 20. and 23. respectively.

Of the 177 beekeepers responding, 78 (44.1%) said they did and 70 (39.5%) that they did not use any monitoring or biotechnical control methods for *Varroa*. No coherent response to this was received from the remaining 29 (16.4%) of beekeepers.

The returns about monitoring infestation levels and using biotechnical control measures are summarised in Table 28.

Treatments	Months												Totals	
	2013									2014				
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar		Apr
Monitoring	30	24	26	29	42	40	30	19	18	16	17	22	22	335
Drone brood removal	5	8	22	16	14	2	1	0	0	0	0	1	2	71
Heat treatment	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Queen trapping	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	3	5	7	7	10	8	4	2	4	2	2	1	3	58
Totals	40	37	55	52	66	50	35	21	22	18	19	24	27	466

Table 28: Summary of uses of monitoring techniques and biotechnical treatments

Monitoring of infestation rates is performed repeatedly by most beekeepers and at different seasons. The most frequently applied biotechnical method of control is drone brood removal. Naturally this is confined to the spring/summer months when drone brood is available.

Quite a number of "other" biotechnical techniques are mentioned. Many of them are in fact chemical treatments and belong in the next section, but there are 3 which are genuinely biotechnical. They are dusting with sugar (usually icing sugar), sometimes in association with other things such as essential oils, which was mentioned 7 times, artificial swarm which was mentioned once and also "changing floor" mentioned once, though this last is not usually recognised as an effective measure against *Varroa*.

Of the 177 beekeepers, 111 (62.7%) said they used some form of chemical control against *Varroa*, 31 (17.5%) said they did not and 35 (19.8%) did not answer the question.

Thirteen different possible specified chemical treatments to control *Varroa* were mentioned in the questionnaire, and the returns concerning them are shown in Table 29. The abbreviations used in the table for reasons of space are explained in the following Table 30.

Treatments	Months												Totals	
	2013								2014					
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar		Apr
F A (S)	12	2	1	2	2	1	2	0	0	0	2	0	1	25
F A (L)	0	1	3	0	2	3	3	1	0	0	0	0	2	15
L A	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Ox A (Tr)	2	0	0	0	0	2	2	1	31	19	3	1	2	63
Ox A (Sb)	3	1	0	0	0	2	3	2	5	5	2	0	0	23
H/B/B	2	3	4	4	2	2	1	2	0	0	0	1	1	22
Th	1	3	2	3	5	13	11	6	1	0	0	1	3	49
τ -F (Apn)	5	0	0	0	1	7	3	0	0	0	0	2	1	19
Flm (Bv)	0	0	0	0	0	3	1	1	0	0	0	0	0	5
Am str	3	3	1	0	3	19	8	2	2	2	1	0	0	44
Am fm	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Cm P	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cm str	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	1	0	0	0	1	1	1	0	1	1	0	1	0	7
Totals	30	13	11	9	16	54	35	15	40	27	8	6	10	274

Table 29: Summary of uses of chemical treatments

Abbreviation	Detailed explanation
F A (S)	Formic acid short treatment (3 days or less)
F A (L)	Formic acid long treatment (4 days or more, e.g., Mite Away Quick Strips – MAQS)
L A	Lactic acid
Ox A (Tr)	Oxalic acid by the trickle method
Ox A (Sb)	Oxalic acid by the sublimation method
H/B/B	“Hiveclean”, “Bienenwohl” or “Beevital”
Th	Thymol in any form, e.g., thymol-soaked pad, Apiguard or Apilife Var
τ -F (Apn)	τ -fluvalinate usually as Apistan strips
Flm (Bv)	Flumethrin usually as Bayvarol strips
Am str	Amitraz strips (e.g., Apivar)
Am fm	Amitraz fumigation
Cm P	Coumaphos as Perizin
Cm str	Coumaphos strips
Other	Other

Table 30: Explanations of abbreviations for chemical treatments

The two most frequently cited chemical treatments are oxalic acid by the trickle method (63 uses) and Thymol preparations (49 uses). Thymol was mainly used in September and October, which is surprisingly late for this chemical that does not work well at low temperatures.

The most frequent months for treatment are September/October, with a second peak mainly of use of oxalic acid in December and January. There is a third lower peak in April, with quite frequent short term use of formic acid then.

Amitraz strips (Apivar) were quite frequently used, but there was only one use of Amitraz fumigation and none of Coumaphos in any form.

The “other” chemical treatments mentioned were:– Apivar (3 times), oxalic acid (trickle) and Varroa-gard. Only Varroa-gard is new here, the others being ones in the main list but missed by the respondent.

The use of Open Mesh Floors among respondents is summarised in Table 31.

Use of Open mesh floors	Number	% of responses	Overall %
Use them	124	84.4%	70.0%
Do not use them	23	15.6%	13.0%
No response	30		16.9%
Total	177	100%	100%

Table 31: Use of open mesh floors for most stocks

Thirty beekeepers (16.9%) did not answer this question. Of the 147 who did answer, 124 (84.4%) said they used open mesh floors and the remaining 23 (15.6%) said they did not. Open mesh floors continue to be as widely favoured as they have been in other recent years.

3.8 Migratory Beekeeping and Pollination Contracts

Beekeepers were asked if any of their colonies were moved for honey production or for pollination during 2013. Those who said they did move some of their colonies were asked how many colonies they moved.

Of the 177 beekeepers responding to the questionnaire, 11 did not answer this question, and only 23 (13.9% of those responding) said that they had moved colonies for one or other of those reasons during 2013. Clearly the majority of members of the SBA do not move their colonies.

The responses to the question to those who did move colonies about the numbers of colonies moved are summarised in Table 32. Only one of those who stated that they had moved colonies failed to answer this question.

Number of colonies moved	Frequency of occurrence
1	3
2	2
3	3
4	6
5	2
8	1
12	1
16	1
21	1
22	1
30	1

Table 32: Numbers of colonies moved in 2013

This table however gives no idea of what proportion of their colonies the respondents are moving. Figure 2 is an attempt to illustrate that by plotting these numbers moved as percentages of the numbers of colonies being kept in October 2013 (following any migration) against the sizes of the beekeeping enterprises involved, as measured by those numbers of colonies being kept. Clearly one beekeeper has moved all his colonies in the summer and has subsequently reduced his number of colonies, resulting in the apparent paradox that he has moved more than 140% of his colonies. It appears that 7 of the 22 moved all their bees (there are 2 ties among the smaller sizes of enterprise) but the other 15 moved varying proportions.

Percentage of colonies moved against size of beekeeping enterprise

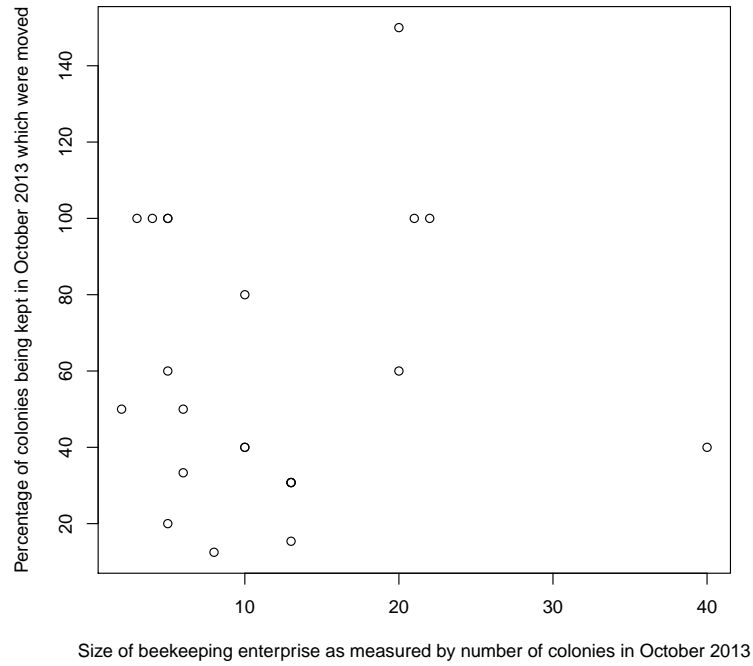


Figure 2: Proportions of colonies moved

3.9 Forage Crops

Beekeepers were asked to state on which of a number of different possible crops they believed their bees had foraged during 2013. The results are summarised in Table 33. Some use has already been made of these data in analysing winter losses by those whose bees had or had not foraged on Oil Seed Rape.

	No response	No	Uncertain	Yes
Willow	12	17	42	106
Dandelion	12	6	24	135
Oil seed rape (early)	12	98	26	41
Top fruit (apples, pears etc)	12	21	38	106
Raspberry	12	23	58	84
Oil seed rape (late)	12	116	38	11
Maize	13	126	38	0
Sunflower	13	107	50	7
Field beans	13	96	58	10
Clover	13	6	53	105
Bell heather (Erica)	12	62	50	53
Lime (Tilia)	12	31	60	74
Rosebay willow-herb (Chamerion)	12	7	47	111
Ling heather (Calluna)	12	57	54	54
Himalayan balsam (Impatiens)	13	48	64	52
Ivy (Hedera)	12	18	55	92
At least one other	14	14	80	69

Table 33: Forage crops used by bees in 2013

The ones most frequently reported are, as in the 2013 survey, the two early sources Dandelion and Willow, followed by Rosebay Willow Herb, Top Fruit, and Clover. Ivy has moved one place above its position last year to displace Raspberry. Lime again appears ahead of the traditional Scottish crop plant of Ling Heather, which is of course confined to moor and hill country.

No-one stated that their bees had foraged on maize. This is unsurprising given the climate in Scotland. A few stated that their bees had foraged on Sunflower or Field Bean. Field Bean is grown quite widely in Scotland now, and is an important source of forage to many Scottish beekeepers. There are also many who are unaware whether Late Oil Seed Rape is available to them. Possibly many beekeepers are unaware that autumn sowings flower in April/May, whereas spring sowings flower in mid to late June, so confuse these two sources.

Beekeepers were also asked to say if there were other sources of forage their bees had used. Of the 165 beekeepers responding to most parts of this question, 69 (41.8%) did state that there were such plants available to them. As in 2013 they were then asked to state what these were.

A very wide range indeed of such “other” plants was mentioned. Those mentioned more than once are shown in Table 34, where they are listed in descending frequency of the number of times they were mentioned.

Crop	Number of mentions
Sycamore	27
Gorse	14
Hawthorn	9
Bramble	8
Cotoneaster	7
Horse chestnut	6
Black-currant	5
Snowdrop	5
Broom	4
Buddleia	4
Borage	3
Comfrey	3
Crocus	3
Hebe	3
Meadowsweet	3
Thyme	3
Red/white-currant	3
Birch	2
Bluebell	2
Ceanothus	2
Fuchsia	2
Hogweed	2
Knapweed	2
Lavender	2
Mustard	2
Species roses	2
Thistle	2

Table 34: Other forage crops frequently named as being used by bees

Those mentioned only once are shown in the list below:-

Acacia, Asparagus, Aster, Beech, Blackthorn, Bog asphodel, Cherry, Clematis, Cornflower, Elder, Escallonia, Forget-me-not, Geranium, Globe artichoke, Gooseberry, Hazel, Hellebore, Honeysuckle, Lilac, Limnanthes, Loganberry, Lupin, Mint, Poppy, Red dead nettle, Red hot poker, Rosemary, Scabious, Sedum, Strawberry, Tree peony, Whitebeam.

As in 2013, whether all these plants are really visited by honey-bees appears somewhat doubtful to us. For example Buddleia is generally said to have flowers too deep for honey-bees to be able to forage usefully on them.

Again omitted from this report are many general observations about “garden flowers”, “wild flowers” etc.

3.10 Management Issues

3.10.1 Percentage of brood combs changed

Again in 2014 beekeepers were asked approximately what percentage of brood combs they replace in production colonies each year. It is generally said that replacing old combs will reduce the burden of many pathogens within the hive, though drawing new comb is of course a burden on the colony.

This question was answered by 160 of the 177 beekeepers responding to the questionnaire. The results are displayed in Figure 3.

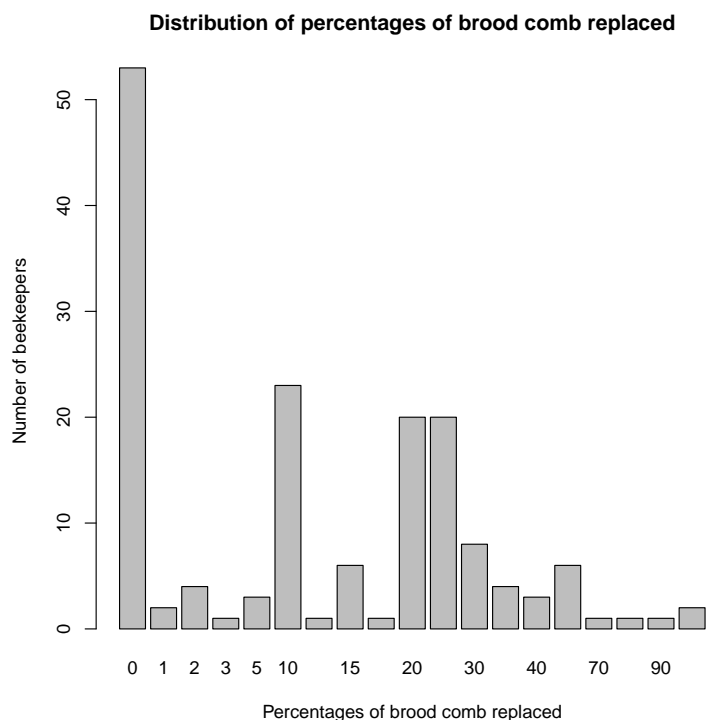


Figure 3: Percentage of brood combs regularly replaced

Practice is again variable among the beekeepers responding, so that there appears to be no guiding philosophy behind what most beekeepers are doing at present. The mean percentage reported as being replaced is this year a little under 16%, a very little lower than in 2013. However the standard deviation of these percentages is this year over 18%, so not much reliance can be placed upon the mean as typical of usual practice. The median percentage is 10%. The bar-chart is a better guide to what is going on.

This year 53 of those who responded, just over one third of them, stated that they replaced no brood comb. Again the most commonly reported percentages being replaced by those who did replace some brood comb were between 10% and 30%.

3.10.2 Feeding regimes being practised

The other management issue addressed was what feeding was being supplied to stocks by beekeepers.

Four distinct feeding seasons were asked about, Summer 2013, Autumn 2013, Winter 2013–14 and Spring 2014. For each season, beekeepers were asked which of each of 5 possible types of feed they had used for their bees — **Sugar Syrup**, **Bee Feeding Syrup**, **Candy/Fondant**, **Honey (not the colony's own)** and **Pollen Substitute**.

The results are summarised in Tables 35, 36 and 37. The first of these lists the numbers of times each feed-stuff is reported as being used at each season, the second the percentage for each season of uses of each feed-stuff, and the third for each feed-stuff the percentage of uses by season.

	Summer13	Autumn13	Winter13–14	Spring14	Sum
Sugar Syrup	35	93	19	57	204
Bee Feeding Syrup	12	46	10	22	90
Candy/Fondant	3	4	111	31	149
Honey	1	2	1	2	6
Pollen Substitute	0	2	2	26	30
Sum	51	147	143	138	479

Table 35: Totals of feed uses reported for each feed and season

	Summer13	Autumn13	Winter13–14	Spring14	Total percentages
Sugar Syrup	17.2	45.6	9.3	27.9	100.0
Bee Feeding Syrup	13.3	51.1	11.1	24.4	100.0
Candy/Fondant	2.0	2.7	74.5	20.8	100.0
Honey	16.7	33.3	16.7	33.3	100.0
Pollen Substitute	0.0	6.7	6.7	86.7	100.0

Table 36: Percentages of uses of each feed by season

	Summer13	Autumn13	Winter13–14	Spring14
Sugar Syrup	68.6	63.3	13.3	41.3
Bee Feeding Syrup	23.5	31.3	7.0	15.9
Candy/Fondant	5.9	2.7	77.6	22.5
Honey	2.0	1.4	0.7	1.4
Pollen Substitute	0.0	1.4	1.4	18.8
Total percentages	100.0	100.0	100.0	100.0

Table 37: Percentage of feeds at each season using each feed type

Looking at Table 35, it is clear that over-all the most commonly used feed-stuff is Sugar Syrup, with Candy/Fondant being the second most frequently used. Commercially prepared Bee Feeding Syrup is considerably less frequently used than Syrup made up from ordinary sugar. Honey is very little used as a feed, other than the colony's own. The risk of transmitting disease by this route is evidently well known among most of the beekeepers reporting here.

Some feeding is reported in summer, but the most common times to feed are, in descending order of reporting, autumn, winter and spring.

From Table 36 it is evident that both Sugar Syrup, and Bee Feeding Syrup, the liquid feeds, are most usually applied in Autumn and Spring. This is in conformity with the usual advice that feeding liquid in winter, with the attendant risk of causing dysentery among the bees, should be avoided, although about 10% of the uses of these feedstuffs is in fact reported in winter.

In contrast almost 75% of the use of Candy/Fondant takes place in the winter, with the remainder of use being almost all in the Spring (20.8%). Again this is the orthodox pattern advocated in advice to beekeepers.

Pollen Substitute is in a rather different category, as it is little used as routine feeding, but evidently as a spring stimulant for colonies by some beekeepers.

Finally from Table 37 we see that in summer more than two-thirds of feeding was with Sugar Syrup, most of the remainder being Bee Feeding Syrup, the pattern in autumn being similar. In winter by contrast almost three-quarters of the feeding is with Candy/Fondant, though some Sugar Syrup is used then also. In spring, Sugar Syrup starts being used more freely, though some use of Candy/Fondant persists, and almost 20% of the feeding then is of Pollen Substitute.

In addition to the named feedstuffs being used at different season, beekeepers were also asked to specify any other feed-stuffs they were using at the different season. These are shown in Table 38.

The most frequently mentioned other feed-stuff is the colony's own honey, which was reported as being used in one form or other twice in the Autumn of 2013 and 4 times in the Winter of 2013–14. Three beekeepers reported

using “Hardened bags of sugar” in the winter. This is a technique reasonably frequently advocated in Scotland where standard paper bags of granulated sugar are briefly soaked and allowed to dry off, whereafter the sugar will harden into a solid lump that can be used in place of fondant or candy.

Two of the other feed-stuffs mentioned were a Bee Feeding Syrup and Fondant, both of which should have been reported as part of the previous response.

The other feed-stuffs mentioned each only occurs once, so are clearly all isolated choices by single beekeepers.

	Summer13	Autumn13	Winter13–14	Spring14
Colony’s own honey		2	4	
Home-made invert sugar syrup		1		
Fondant			1	
Hardened bags of sugar			3	
“Vitafeed green”	1		1	
“Vitafeed gold”		1		
Bee Feeding Syrup	1			

Table 38: Other feed-stuffs being used with their frequencies at the different seasons

3.11 Final Comments

The final question near the end invited all beekeepers to name any additional matters of concern to them which had not been covered elsewhere in the questionnaire.

As in 2013 there was a variety of topics raised, and it is not easy to summarise them all briefly. Those which can be grouped in common themes in frequency of occurrence are listed in Table 39.

Topic	Number of mentions
Adverse effects of pesticides on honey-bees	8
Difficulties of disease control	6
Risks associated with poorly controlled import and movement of bees	4
Difficulty of providing adequate education in beekeeping in remote areas	3

Table 39: Other concerns

A variety of other topics was mentioned just once, but those above appeared to be the main areas of concern to a number of respondents in 2014.

3.12 Difficult questions

All respondents were asked whether there were any questions that were difficult to answer, with an opportunity to supply details. Only one question was mentioned in particular, and that was the one on Bee Forage which was mentioned just once, because it did not list enough of the different forage plants available to this beekeeper.

However a general concern was that several email respondents did not find out how to go back to amend earlier answers in the online questionnaire. This is a matter of altering settings in the LimeSurvey questionnaire package, which has been addressed for future years.

3.13 Proportion supplying contact details

The numbers and percentages of those supplying their contact details with their responses are summarised in Table 40.

There is very little difference between the proportions of those responding electronically and those responding by post who supplied their contact details. However the over-all proportion of 67.6%, or just over two-thirds, is lower than we observed two years ago and in all previous years.

The proportions supplying their contact details in the last few years have been in 2011 81%, in 2012 83%, and in 2013 67%.

Details supplied	Response type					
	Electronic		Postal		Over-all	
	Count	Percentage	Count	Percentage	Count	Percentage
Yes	121	67.2	23	69.7	144	67.6
No	59	32.8	10	30.3	213	32.4

Table 40: Contact details supplied

It is possible that this simply reflects a growing reluctance among the public in general to disclose details. However one change that we made in the format of the questionnaire in 2013 for the first time was that this question was moved from the beginning to the end of the questionnaire. As remarked earlier, we intend in 2015 to revert to the older arrangement in the hope that this may induce a higher proportion again to be willing to disclose contact details to us. This can be helpful in case of a query concerning the data supplied, as a means of passing on survey results, and also as a means of contacting beekeepers to alert them to other projects of possible interest.

4 Discussion

In 2014 for the second time we made use of an online survey package for the bulk of our survey. We were more confident this time and as a result were able to increase the sample size without incurring unacceptable additional cost. Data processing was faster and more straightforward, and we believe has led to a better standard of data acquisition and analysis.

We did however continue with a postal element in the survey, since, as the data in this survey shows, those without online access do differ quite markedly in several respects from the rest of the SBA membership, with more males, more elderly members, and a greater proportion of members with more experience of beekeeping.

The season of 2013–14 was a much easier one for beekeeping in Scotland than the preceding, exceptionally hard, year. The reported winter loss rate of 13.5% over-all was less than half the 31.6% reported the previous year. Nevertheless there was a high reported rate of Queen Problems among the lost colonies, perhaps reflecting poor mating conditions the previous summer.

An intriguing finding was that reported winter losses this year were at a significantly higher rate among bees that had not foraged on Oil Seed Rape than among those that had. This is the opposite from what had been reported two years earlier, and so does not in itself support the idea that neonicotinoid pesticides used to treat this crop are having a demonstrably harmful effect on honey-bee colonies.

There is some evidence that awareness of the *Varroa* mite is improving, although there are still some beekeepers who are failing to monitor infestation levels, even though they are aware that the pest is present in their bees.

A greater range of chemical control measures were reported as being used this year. No universally acceptable treatment is available, so possibly the maintaining of an arsenal of different possible treatments is, at least at present, the best policy.

Appendix: questionnaire used

SBA Survey 2014 Questionnaire (Postal version) A1 Preliminary questions

1. Were you keeping bees at any time between April 1st 2013 and May 1st 2014?

[A1Beekeeper]

Yes/No

Please ring one.

2. If you answered 'No' to question 1:–

- (a) are you interested in becoming a beekeeper?

[A2Interested]

Yes/No

Please ring one.

- (b) have you previously been a beekeeper?

[A3Previously]

Yes/No

Please ring one.

If you answered 'No' to Question 1, this is almost the end of your questionnaire. Please turn now to Section R on the last page.

But if you answered 'Yes' to Question 1, please continue with the questionnaire.

Questions for practising beekeepers

A2 Beekeeper profile

3. For how many years have you been keeping bees?

Please insert number. If you are a newcomer to beekeeping you may indicate (say) 1/2 or 1/4 of a year.

[A4Experience]

4. In which age group are you?

[A5AgeGroup]

Please tick one box.

Under 20	20–29	30–39	40–49
50–59	60–69	70 or over	I do not wish to answer

5. Are you male or female?

[A6Gender]

Please tick one box.

Male	Female	I do not wish to answer
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B Beekeeping Activities Intro

6. For how many separate permanent apiaries do you have primary responsibility?

[B1Apiaries]

Please insert number in the box above.

7. If you have more than 1 apiary, are all your apiaries within about 9 miles (15 km) of each other?

[B2ApiaryLocation1]

Yes/No

Please ring one.

8. Please give some indication of where your main apiary is (e.g., a short postcode such as “AB66” or the name of the nearest town or village).

[B2A]

C Beekeeping Activities — Spring 2013 Colonies

9. In total how many production colonies (i.e., queen-right colonies strong enough to yield a honey harvest or to provide a pollination service in season) did you have on April 1st 2013?

[C1.ColoniesApr13]

Please insert the number.

F Beekeeping Activities — Colonies in October 2013

10. In total how many production colonies (i.e., queen-right colonies strong enough to yield a honey harvest or to provide a pollination service in season) did you have on October 1st 2013?

[F1ColoniesOct13]

Please insert the number.

11. How many of your production colonies going into winter in October 2013 were headed by a current year's queen?

[F2/3CurrentQs]

Please insert the number or "Don't know".

G Post winter 2013–14

In the next questions you are asked for number of colonies lost. Please consider a colony as lost if it is dead, or reduced to a few hundred bees, or alive but with queen problems, like a drone laying queen or no queen at all, which you couldn't solve. Please consider winter as the period between 1st October 2013 and 31st March 2014.

12. How many of the wintered colonies were lost during winter 2013–2014?

Please give the total number lost in each way described below, and the overall total of losses.

Pattern/cause of loss	Number	
Over-all total losses		[G1TotalWinterLoss]
Queen problems (queenlessness or drone-laying queen)		[G2WinterQueenP]
Dead workers in cells and no food present in colony (starvation)		[G3WinterStarvation]
Dead workers in cells and food present in colony (isolation starvation)		[G4Winter_Isolation]
In how many of the lost colonies did you observe a large amount of faeces inside the hive? (dysentery)		[G5WinterDys]
How many of the lost colonies did not have dead bees in or in front of the hive?		[G6WinterCDS]
Losses due to effects of varroa infestation.		[G7WinterVarroa]
Losses due to other different known causes		[G8OtherKnownWLoss]
Please specify those other known causes of loss:		
Unknown but different from any of the above		[G9UnknownWLossC]

13. How many colonies did you have surviving on 1st April 2014?

[G10Surviving]

Please insert the number.

14. How many of the surviving colonies were weak?

Any surviving colony with bees covering 3 or fewer frames in April should be considered as weak.

--

Please insert the number.

J Bee Races

Various races of the Western Honeybee (*Apis mellifera*) are kept by beekeepers in Britain. Some beekeepers specialise in specific races, though many accept the local strains of bees prevalent in their own areas, without any particular effort to maintain a pure race. It is believed that some races may be more resistant than others to the threats to bees which are appearing nowadays.

15. Which specific race (if any) of bees do you know with some confidence that you are keeping?

Please tick **only one** relevant box.

[J1BeeRaceKept]

Local strain of no named type	
<i>A. mellifera mellifera</i> (the Northern European dark bee)	
<i>A. mellifera carnica</i> (the Carniolan bee)	
<i>A. mellifera ligustica</i> (the Italian bee)	
The "Buckfast" strain	
Any other named race (Specify below)	
Don't know	

16. If you chose "Any other named race": Please specify:

--

[J1aSpecifyRace]

If you chose any named race please answer:–

17. On what evidence do you base this claim?

[J2RaceTest]

General appearance of bees	
What the provider told me	
Wing morphometry test	
Genetic test of the bees	

Please tick one box.

K Extent of queen problems

18. To what extent did you observe queen problems in your colonies in 2013 compared to what you usually have?

[K1RateQProbs]

Higher than normal	
Normal	
Lower than normal	
Don't know	

Please tick one box.

L Varroa awareness

19. (a) Do you keep your bees in an area where varroa has already been detected?

[L1VarroaInArea]

Yes/No/Don't know

Please ring one.

Only if you answered "No" or "Don't know" to question (a) please answer question (b).

(b) What steps (if any) did you take during the past year to detect any infestation of your bees with *Varroa*?

[L2.VarroaDetection]

Steps taken	Please tick or leave blank
Sent floor scrapings to SASA	
Personally examined floor scrapings	
Other (specify)	
None	

Only if you answered "Yes" to question (a) please answer questions (c)-(d).

(c) Do you monitor the levels of *Varroa* infestation in your bees?

[L3MonitorVarroa]

Yes/No

Please ring one.

If 'Yes', please tick all the methods used:-

[L3aVMonitoringMeths]

Calculating daily natural mite drop

Uncapping sealed drone brood

Other (specify) [L3bOtherMon]

(d) In which year did you first find any of your colonies of bees infested with *Varroa*?

[L4VarroaYear]

Please tick the relevant box.

Before 2013	
In 2013	
In 2014	
<i>Varroa</i> not yet detected	

M *Varroa* control

20. Could you please indicate in what month and year you monitored and/or started every biotechnical *varroa* treatment of your production colonies during the period April 2013 – April 2014?

[M2VBioWhen]

	2013									2014			
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Monitoring of <i>Varroa</i> infestation levels													
Drone brood removal													
Heat treatment of brood/bees													
Complete brood removal including queen trapping													
Another bio-technical method													

21. If you used “other” biotechnical methods, please describe them here.

[M2AOthBio]

22. Have you used a chemical control against varroa during the period April 2013 - April 2014?

[M3VChemC]

Yes/No

Please ring one.

If you answered "Yes" to the last question please answer:-

23. In which of the months listed did you begin treatment with any of the chemical Varroa control agents listed below or with other chemical agents?

[M4VChemWhen]

	2013									2014			
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Formic acid (short term) i.e., 3 days or less													
Formic acid (long term i.e., 4 days or more, e.g., Mite Away Quick Strips MAQS)													
Lactic acid													
Oxalic acid (trickle method)													
Oxalic acid (sublimation)													
Hiveclean/Bienenwohl /Beevital													
Thymol, e.g., Apiguard, Apilife Var													
tau-fluvalinate e.g., Apiguard													
Flumethrin e.g., Bayvarol													
Amitraz strips e.g., Apivar													
Amitraz fumigation													
Coumaphos (Perizin)													
Coumaphos strips (e.g., Checkmite)													
Another chemical method													

24. If you used "other" chemical methods, please describe them here.

[M4aChemOth]

25. Do you use open mesh floors on most of your hives as a measure against *Varroa*?

[M5OpenMeshFloors]

Yes/No

Please ring one.

N Migratory Beekeeping

26. Were any of your colonies moved for honey production or pollination during 2013?

[N1MigratYN]

Yes/No

Please ring one.

If you answered "Yes" to the last question, please answer the following question

27. How many of your colonies were moved at least once for honey production during 2013?

[N2MigratCols]

Please insert number.

O Forage crops

28. Have your colonies foraged during 2013 on:-

[O1ForagePlants]

[O2]

	Yes	Uncertain	No
Willow			
Dandelion			
Oil Seed Rape(early)			
Top fruit (apple, pear, cherry or plum trees)			
Raspberry			
Oil Seed Rape (late)			
Sweetcorn/maize			
Sunflower			
Field bean (Faba)			
Bell heather (Erica)			
Lime (Tilia)			
Rosebay willowherb (fireweed)			
Ling heather (Calluna)			
Himalayan balsam			
Ivy			
Other (first)	Specify:		
Other (second)	Specify:		

P Management issues

29. Approximately what percentage of brood combs did you replace per colony in 2013?

[P1CombRep]

Please insert approximate percentage.

30. What feeding of your bees did you undertake in the past year?

[P2Feeding]
[P3.OthFeed]

Please tick any box when a particular feed was used (or specify another feed).

Type of feed	Season			
	Summer 2013	Autumn 2013	Winter 2013–14	Spring 2014
	Used	Used	Used	Used
Sugar syrup				
Bee feeding syrup				
Candy/fondant				
Honey (not the colony's own)				
Pollen substitute				
Other: specify				

Q Final

This survey has dealt with those matters we believe are of primary concern to beekeepers in Scotland at present. But if there are other matters you are concerned about please tell us about them here.

[Q1OtherConcerns]

.....

.....

.....

.....

.....

31. If you found it difficult to answer the questionnaire, please indicate the number(s) of the question(s) you found difficult to answer, with additional explanation if you wish.

[Q2DifficultQns]

Question	Comment

R Contact details or anonymous response

If you are willing to do so, please give us your contact details so that the survey organisers can follow up with you any interesting points raised by your answers. Note however that you do not need to supply these, and if you do not, your response will remain anonymous. **If you supply your email address, we shall send you the key findings as soon as they become available, before the main report is published.**

Please give your contact details here:–

Title [R1Details]

First Name [R1Details]

Last Name [R1Details]

Phone No

email address

Postal Address

.....

.....

Postcode

OR

I wish my response to this questionnaire to remain anonymous.

Tick box if anonymous return desired.

Thank you for your help. We plan to publish the main findings of the survey in brief in “The Scottish Beekeeper” in late summer/autumn of 2014, and to make the full report available on the SBA web-site when it is finished.

Be assured that your identity will not be revealed in any report of this survey.