Notes from BOP Field Day, 3 June 2000, HortResearch Orchard, No 1 Road, Te Puke

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Gerrit Hyink: Opening

Thanked sponsors for the day: HortResearch, AlphaBees, Comvita, and Wilderland Trust.

Cliff Van Eaton

Quoted Jane Lorimer's words to Auckland meeting: "Beekeeping changed forever on 11 April"

Delimiting now either near or fully complete. Technical Advisory group met previous Wednesday. Operational Plan for Eradication has been prepared. Where to from here? Contract for development of plan for control has now been let to AgriQuality. Cost:Benefit analysis to be developed within MAF Policy. Survey of affected beekeepers may be undertaken to determine degree of co-operation expected from them. Ultimately (around the end of June?) Cabinet will make a decision on future direction.

Background to today was the branch's feelings that members needed to hear from people with authority, so we have invited the various specialists to present their information to us.

Wearing two hats today, that of Comvita (as employer) but also the hat of authority provided by the branch (covered with various badges). Ground rules of the day is that this is not a branch meeting, and there will be no resolutions to come from it. It is for information only. Members should ask questions, but don't give speeches of their own. Above all, be civil and polite.

Dr Denis Anderson

From CSIRO (Commonwealth Scientific and Industrial Research Organisation), Australia.

Returned to Australia 11 years ago after working as bee pathologist in NZ. At that time, varroa was just on Australia's doorstep, in Papau New Guinea. Recent work has indicated that there is in fact a new name for the varroa we know on Apis mellifera, Varroa destructor. Various ramifications to that finding that he'll discuss in the talk.

Varroa was not originally on our honey bee, Apis mellifera. It is on Apis cerana throughout Southeast Asia, and exhibits similar behaviour.

Varroa was originally found in Java in the early part of this century by a man named Jacobson. It was described by Odemanns, and it was in fact a new genus. There are not other varroa like mites - it is the only one in that genus.

About 50-60 years ago, varroa appears to have ‘jumped hosts’ to our honey bee. There are in fact three species of varroa already named: jacobsoni, underwoodi and rinderera.

When Denis first started working in Irian Jaya/Papua New Guinea, he found amazing behaviour. The mites in PNG (which would have come originally from Java) were not reproducing on Apis mellifera! Other researchers around the world had taken own direction, and didn’t seem especially interested in the finding, or had other explanations of their own. Published this in 1994 in Apidolgie. Only researcher who took interest was a German bee scientist, so Denis worked with him over the next few years.

Considered that the failure to breed was in some way related to either:
* resistant bees
* genetically different mites
* some environmental factors

Bred 40 sister queens in Australia and sent 20 to Germany (where there was varroa present) and put 20 in PNG. The colonies in Germany were soon killed completely by varroa, but the PNG colonies remained.

Took DNA out of the mites in the two places and compared it. Found 6.7% difference in mtDNA on chromosomes which should not have been much different at all - this was a *big* difference. Published this in 1998 in the Journal of Apicultural Research.

Decided at this stage to go back to look at varroa on its natural host, Apis cerana. Did DNA sequencing from the varroa found on cerana throughout SE Asia, with very wide geographical sampling. For the mites all considered to be 'jacobsoni', found in fact about 6 species. Very tidily geographically confined - jacobsoni was confined for the most part to Indonesia and Malaysia. Another species (which is now being called destructor) found mostly in mainland Asia. Some others, others unresolved (which will perhaps lead ultimately to other new species) from both Philippines and Sri Lanka.

Destructor is significantly larger body size than jacobsoni, and not so round. The two cannot interbreed.

Did more extensive testing on the COIII gene. Again, the distribution turned out the same, with differences from mainland Asia to the Indonesian groupings, and still the unresolved differences in Philippines and Sri Lanka.

Then did survey for varroa found in 32 countries on Apis mellifera. Found that there had been two types of the mite that had in fact changed over to mellifera from cerana - now called the Korean and Japan/Thailand types). Korean most widely distributed, even where cerana is present. It is this one that is present in Europe, US, etc.

The Japan/Thailand type present and now spreading out of Brazil, explained by the fact that honey bees were taken to Brazil from Japan in 1972. This type now spreading into US from the south.

Published this all in Journal of Experimental and Applied Acarology. Easier to read review now available from Apidologie.

Ramifications of this all. There is a name change to contend with, from Varroa jacobsoni to Varroa destructor. Said that after presenting the paper in Canada, beekeeper said the change in name shouldn't be too hard for them. They'd only just gotten used to saying "My bees have VJ", so the change would be interesting...

Impacts on bee trade and quarantine issues, with two species involved. Bee management and control methods may well be impacted. Even destructor is not especially good at breeding on mellifera - does not manage the necessary 'signal' to initiate reproduction, so the development is not especially good (though obviously good enough to kill!). This weakness could lead to some form of permanent control method, if the signal could be disrupted or changed in some way. Finally, all previous research needs to be reviewed in terms of the fact that there are two different species involved.

Denis wanted to make a special acknowledgement to the ACIAR (Australian Centre for International Agricultural Research) who has been far-sighted enough to continue to fund his work, along with CSIRO his direct employer.

Denis then moved into a detailed description of the varroa lifecycle. Varroa enters the cell in the pre-capping stage and buries itself upside down in the brood food. Once the larva has eaten most all the food and turns around preparing to pupate, mite moves onto position on abdomen. Moves from there to sit on the wall of the cell for a time. Once the larva has finished pupating, mite rejoins and begins to feed. About 70 hours later, lays first egg. First is male, then generally about 5 females. They develop in the cell before the bee emerges. Male mates with his sisters then dies. Females come out of the cell with the bee to continue the process. Eventually re-enter a

cell to repeat the cycle. Goal is to develop some means of moving the signal 'out of the range' so that mite will fail to reproduce.

Future control mechanisms for varroa were discussed. European methods appear to be moving from straight chemical control, to use of such things as organic acids. Spring often mechanical controls (variations on drone brood trapping of the mites to keep their number down). Later, uses of organic acids (such as formic acid, as spot treatment or longer). Autumn treatment with chemicals as required. Avoids continuous treatment. Goal is to reduce mite numbers through the winter period - if you can't do this, numbers rise too quickly in the main part of the season.

Question about Russian queens sold in US for resistance. Rinderer took bees from Russia, near area of original changeover to mellifera, and bred them. Being released to beekeepers as unmated queens. Possible resistance, but not clearly shown yet.

Denis was confident that some form of final control method could be found. Expected it could take about 3 years to identify the 'signal' that he referred to (as he has a fair idea of what it is already). From then, should be relatively easy to develop some means of delivery.

Discussed finds of Apis cerana (from PNG) in Australia, one of which did have jacobsoni. Difficulty in explaining to beekeepers that they didn't have to worry, as even if it *did* get out into the mellifera population, it would not breed.

Andrew Matheson

Now International Agreements Manager with MAF. Formerly AAO in Tauranga, then with IBRA. Has written two books about varroa.

Will discuss the economic impact of varroa throughout the world, the responses of regulators, how beekeepers have adapted to live with varroa, and the possible impacts in NZ.

Damage has been described as into the millions of hives in Russia from 1975-85. Loss of 50% of the hives per year in Yugoslavia. Loss of 65% of hives in Italy. 50-100% of hives in Israeli businesses.

But also described to him recently by North American contact as "best thing to ever happen to beekeeping". It eliminated feral bees. It also eliminates the ‘marginal beekeepers’. Each hive put into pollination has a greater value, giving more return to the beekeeper. The good beekeepers got better, with increases in size and net returns.

Found there has been no rigorous studies on the economic impact of varroa through the world. Reasons for colony death often not really certain, hive numbers will decline for a variety of reasons, there is an incentive to exaggerate the reporting and most beekeepers/researchers feel that they have better things to do with learning to control, etc.

Throughout the world, varroa spread in countries has followed the same pattern: high losses initially, losses lessen as beekeepers learned to adapt. Four phases described.

1. Initial discovery. Lack of even initial diagnostic methods. Other nearby countries expecting the imminent arrival.

2. Eradication attempt. Close the borders, restrict/prohibit movements of hives. Destroy colonies found with varroa – happening especially in the 1970s. Felt that destruction of infected colonies *on its own* is futile – the spread is always ahead of where it was thought to be contained. Destruction is not appropriate if eventually it must be abandoned. With tracheal mites into the US, some destruction still occurred (late 1980s). When varroa came in three years later, industry was 'sensitised' to the futility of destruction on its own.

3. Attempts to limit spread. Movement restrictions. Beekeepers usually keen for this method of control and apply political pressure. Relatively easy for regulators to agree to this. Quarantines usually too late to be effective. Described experiences of US, Netherlands and UK. Attempts to limit spread always appear to be 'behind the name'. Issues of equity, with unequal effects on beekeepers. Buys time, but with the impact being harder on some beekeepers. Issues of lack of compliance with methods imposed.

4. Living with varroa. There is no 'silver bullet', much as people would like one. This phase breaks into two parts – acute and chronic. Acute covers the time of initial infection. Perhaps the beekeeper even uses one of the recommended treatments. There is little loss. The infestations, however, even in the treated hives, increases. That is because of re-infestation from collapsing colonies from surrounding beekeepers who are not treating in any way. Ultimately, this will lead to high losses. The chronic phase is a period when infestations decreases, then stabilises. Poor beekeepers are gone by now. The control methods have been learned and applied, and the losses are manageable.

Andrew posed 8 question areas.

1. Regulatory decisions. Need for on-going surveillance and monitoring? Should there be compulsion to treat colonies? Movement controls? Any need for regulation at all? Should there be a PMS developed for future control measures?

2. Control options. What are the best control methods? How can beekeepers learn how to best control varroa? What are the roles of education and extension services. What monitoring techniques should be used? What are the range of ‘hard’ and ‘soft’ control methods available? What chemical treatments might be acceptable to still produce certified organic honey? What non-chemical, biotechnical control methods are available? Access to overseas help and experience?

3. Strategic approach to registration of varroacides. Leave it to ‘the market’ or make sure we have more than one available?

4. Product purity. Who will monitor for residues in honey? What damage can be caused through misuse?

5. Research. Varroa will become dominant in the research portfolios?

6. Disease Control programmes. Varroa will ‘skew’ the direction? Will the focus on the AFB PMS be retained as needed?

7. Extension. The value of information on its own is limited. UK has seen a re-invigoration of its agricultural extension service to provide beekeepers with the information and tools required to deal with varroa.

8. The industry. Need for a strong organisation, with an emphasis on communication. Need for efficient and knowledgeable presence to deal with Wellington…

Questions . Andrew acknowledged that movement control in Saskatchewan may well have slowed spread. Comment that colder climates may contribute to that and other examples, too. Andrew had stated he’d like to have a clear month to ring/email to find out the real situation around the world, but all he is doing just now is part-time and unpaid, in effect, as he has other work to do.

Mark Goodwin

While Andrew was discussing, for the most part, overseas scenarios, we need to be able to predict matters for NZ too. Mark kept wondering whether he with his 10 hives was one of the ‘good’ beekeepers who would continue or one of the ‘bad’ ones who would finish. He figured the difference was that a good beekeeper would listen, learn, follow advice at least until knew better on own decisions.

Choices were to eradicate or control.

Eradication of managed colonies. Depopulate all within 15 km radius. Kill bees, salvage honey and most combs. Have to dispose of combs full of brood (as they could contain varroa).

Methods for depopulation. Phosphine gas or some form of pyrethrims. Both are fast and leave virtually no residues.

Managed colonies. Plan to initially depopulate 20,000 of the 300,000 managed colonies of NZ. Will need to have the area free of bees for about 1 1/2 years. Pollination involves the introduction and later destruction of another 48,000 colonies.

Replacing of colonies. Will need to replace about 80,000 hives in total, about 40% of the North Island colonies. How best to be replaced? Some won't want to be replaced. Some commercial beekeepers will choose to take the compensation and retire from the industry. The 80,000 will be divided between spring and summer of 2000 but also into spring/summer 2001.

Compensation. Cost of repopulation and lost income. Quoted section of Biosecurity Act referring to 'no worse off' than those who were not affected.

Ferals. Some are known (many recent telephone calls!). Poisoning programme to eliminate the rest. Poison bait stations on 1 km grid will require 10,000 bait stations, with fortnightly visits to replenish for a one year period.

Monitoring of success for ferals. Use of marked (known) feral colonies. Searching for bees on flowers. Offering rewards. That last one is the important one!

Factors of success of eradication. That the infestation is not spread further. That the effort is properly funded. That there is enhanced surveillance elsewhere. That there is beekeeper co-operation.

Surveillance. Seriously in the top half of the North Island. Every colony requiring checks two times a year. Enhanced surveillance elsewhere.

Movement restrictions. No bee movements from North Island to South. Restricted movements within eradication area after initial depopulation.

Varroa if we accept it is here and attempt to control in NZ.

Mentioned email from Lower Fraser Valley, Canada, where they were in the second year of varroa. Loss of 60% of over wintered colonies. Mark wanted to know why so high. Losses were due to beekeeper who

didn’t recognise they had a problem, beekeepers who didn’t treat correctly, and beekeepers who couldn’t afford to treat.

Overseas trends. Ferals will disapper. Casual hobbyists will stop. Some commercial beekeepers will exit the industry. The beekeepers who remain will have to become more skilled.

In NZ we can expect it would spread all over fairly quickly. Every hive will have varroa. Every hive (to remain alive) will require some form of management programme.

Immediate effects. Colony losses. Downstream losses include an increase in pollination fees. Beekeeper who have marginal businesses, relying on sites on marginal land, will leave the business. May result ultimately in pollination fees for some clover pollination.

Beekeepers will become pest control operators, just like any others…

Large range of chemical control options available. Apistan is the most popular at the moment. Need two strips for 6 weeks, twice a year. $14 cost for the strips only.

Biocontrol would include drone and drone comb trapping. Labour intensive. Use of varroa floor (screened insert to floor). Could trap 15% of varroa. High setup cost, but useful also to monitor infection levels.

Showed three graphs.

Environmental general acceptability: low with chemical control, high with biological control measures.

Skill level required: low with chemical control, high with biological control measures.

Cost: low with chemical control, high with biological control measures.

Will be a tradeoff between the factors, ultimately.

Integrated control involves a mixture of treatment methods. Importance of correct timing and careful monitoring of infection levels. Need for a unified approach with neighbours, with all working together. If varroa is coming into outfit from outside, more treatments (and sooner) will be required.

Important aspects to come include destruction of the ferals, development of effective control methods, integrated control methods, development of a well-skilled beekeeper to implement the control methods, and learning from the mistakes of others.

Without a unified approach, can expect colony losses, greater mite numbers, higher control costs, resistance and residues from improper use of chemicals.

Into the future? More research. Development of new chemicals. New approaches, including biocontrol and perhaps pheromone control measures.

Lunch

Cliff Van Eaton thanked various people for their contributions during the delimiting survey period. Beekeeper volunteers who had contributed. Graeme Cammel who had co-ordinated the beekeepers. AgriQuality who had managed the response.

The final plan (Operational Plan for Eradication) was from AgriQuality, and though it was their ‘final’ copy to MAF Biosecurity, there was still to be developed other aspects of compensation and a covering letter.

James Driscoll

Reported on aspects of the Operational Plan for Eradication.

Buffer zones above and below the eradication zone. Surveillance in the lower North Island. Disease free zones are South Island and Stewart Island.

Hive depopulation in the eradication zone. Ferals destroyed. Depopulation of hives provided for pollination, with those boxes to be later repopulated. Strict movement controls in place.

Depopulation to be by contractors under warrant. Determine hive numbers involved. Honey can be removed. Chemical to be used not yet determined. Depopulated boxes to remain on site for 6 weeks to ensure all mites dead. Storage (movement by permit) in the zone after that.

Ferals. All to be destroyed. Search and destroy not a likely method. Bait stations on 1 km grid. Placed as soon as depopulation of managed colonies complete. Using modified Lynfield fruitfly traps. Uses a honey and poison bait. Preference to employ beekeepers who are not beekeeping…

Eradication will not be complete before pollination period. Will need to depopulate all hives moved into the zone for the 2000 pollination period. Preference to do this on dump sites rather than in orchards. Same compensation available. Baiting for ferals won't be able to take place until the pollination period is past.

Once the areas are free of pollination hives, bait stations will be set up, and uptake monitored. Known feral colonies will be watched to determine effectiveness, as well as through appeals to public.

Repopulation. Can only take place after 6 weeks free of bees. In eradication zone in spring 2001. Use of 4 frame nuc and queen, at $75 per hive. Beekeeper to manage the repopulation. Hope to co-ordinate nuc availability.

Movement controls in eradication and buffer zones. Limited movement (only with permit) until after eradication begins. In buffer zone, all hives would need to be tested clear. Would not be able to leave zone after that. In surveillance area (southern North Island) can move freely within. If moved into other areas, would have to stay there. No movements to disease free zone (South Island) at all.

Testing would be done with Apistan and sticky board. In eradication zone, in the 6 to 12 months following repopulation. In buffer zone, all to be done 2 times a year. In both, until 1 year after last 'blip' (new outbreak).

Surveillance. 1150 random apiaries in buffer zone first year, then at 2 year intervals. In surveillance zone, 1400 random apiaries in first year, then at two year intervals. Sentinal hives to be placed near such areas as ferry terminals, etc.

Compensation. Cost of bees involved in the depopulation set at $75 per hive. Honey – not compensated (as can be removed). Stored brood boxes costs on a case by case basis. Stored combs at $1.20 per box for the extra storage involved. Loss of pollination only if due to the effects of the needs for feral baiting. Depopulation of pollination hives at same $75. Loss of income only for commercial beekeepers, on a case by case basis.

Total cost of programme estimated at $55.7 million.

Not costed are the reduction of honey and bee products produced (due to the loss of 25% of hives). Loss of kiwifruit production. Stress impact on beekeepers. Downstream effects.

Compensation area still somewhat grey, as MAF Biosecurity is needing a legal opinion to determine the real meanings of the Biosecurity Act.

Questions to the panel of all four

(I didn't keep full notes through this; sorry…)

Denis referred again to the 'signal' required for varroa to initiate reproduction. If this signal could be moved 'out of the range' of the variability that varroa can tolerate, could provide permanent control.

Andrew indicated that will emphasis on destruction of ferals, could be some differences with overseas programmes he had described.

Mark said before depopulated boxes could be more quickly moved back into shed, would need to find some means of killing both bees and mites. Otherwise risk of moving the boxes would be too great.

Discussion on decontamination of queens and workers in transit. Re-iterated that all bee movements to South Island would stop.

Mark acknowledged that if the element of compensation were to be doubled, the effort could be more likely of success.

Suggestion of use of bees from the eradication zone for pollination before depopulation. Pointed out that any movement from current sites would eliminate the effectiveness of the programme.

Denis asked point blank about chances for eradication. Described his experiences in very controlled (island and places with tropilaelaps, which really wiped out the ferals…) environments. Even then, he did not feel really confident each time he visited the hives that he had eliminated varroa. Described that there were so many complications involved, that it could be outside the expected area even now. Very difficult task.

Mark indicated the important factors as the ability to eliminate ferals, the possible movement beyond the defined areas, the compliance of beekeepers and the sensitivity of the testing.

Comment that we seemed to be faced with eradication attempt (compensation, then when it fails we have mites) or no attempt (when we just have the mites).

Andrew stressed the need for integrated approach to control methods.

Comment that we would be losing all valuable breeding stock from elimination zone, as there was no method to saving the gene pool.

Quite a few more and various questions and comments made, but I think I've covered the bulk of them…
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