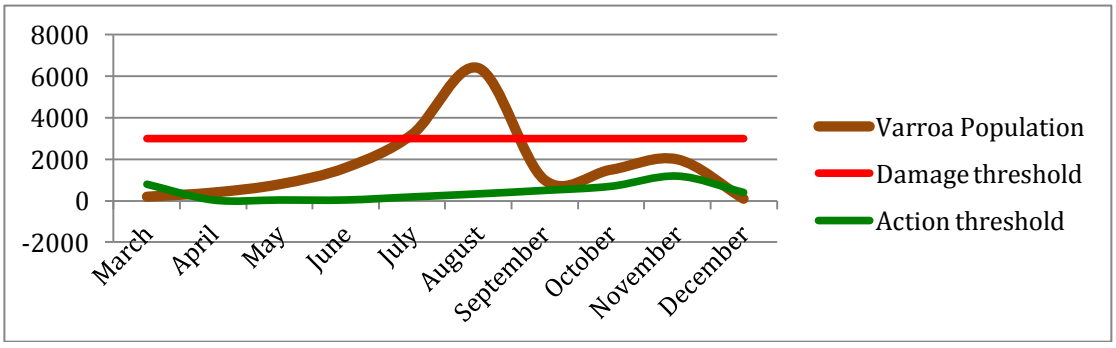
DARG

Predator Mites
'An Experience of their use'

In 2011 Jon Arul was given the task of setting up the 'Bee Vet' on behalf of St. David's Poultry Team Ltd, a Veterinary practice near Lympstone. He was very supportive of research projects carried out within both DARG and Devon BKA.
Having a specialism in poultry and game birds Jon was well versed in the use of predator mites to control red spider mite in bird flocks so wished to research the possibilities of using predators to control varroa mites in live bee colonies rather than using chemotherapy or for inclusion as part of an integrated pest management system. Many beekeepers would prefer not to use, or reduce the use of chemotherapy so effective biological controls would be very inviting.

Before progressing it is worth explaining the situation in regard to varroa control and honeybees. During the active beekeeping season varroa mite populations double every three to four weeks whilst bee brood is present. A typical colony that does not swarm starting with a varroa mite population of 200 in March will end up with a mite population of around 12,800 in September. If a safe biological control could be found that reduced this mite population by 5% a day the exponential growth would cease. Predator mites could theoretically achieve this, though it must be said that generally, biological controls work very well before a pest becomes a problem but are inefficient when it has become a problem. Traditionally chemotherapy has been used after honey removal at the season's end and with the advent of less effective treatments a further treatment in winter is often necessary. Clearly chemotherapy should not be used when honey crops are present due to the risks of chemical contamination.
In the UK the varroa treatment threshold is set at a colony mite population of 1,000 though within Europe it is often set at 3,000. Above 1,000 mites and especially above 3,000 mites, bee virus issues may become very serious which can then kill the colony. Therefore a colony damage threshold is set at 3,000. Generally in USA this is 5,000. The National Bee Unit have published a table and graph showing points where control action should be considered, which in the following graph is shown as an 'Action Threshold'. These actions keep the colony safe without further action until the following season, unless re-infestation occurs from another source. It also illustrates a typical varroa population starting in March at a population of 200 with chemotherapy applied in August at 85% efficacy and November 95%.



Chelifers or Pseudo-scorpions were investigated first and it was found that under lab conditions chelifers will predate Varroa and that the level of predation required to be effective in the hive suggested 25 Chelifers to keep a population of 1000 Varroa mites constant or falling. This assumes that each chelifer consumes 2 varroa mites per day. *(L. L. Fagan et al.)* However chelifers are non-native and transportation can be a

problem as they are prone to eat each other! For these reasons they were considered not suitable.

It was then decided to investigate the predator used for red mite control in poultry and game bird flocks. The mite is one of the species commonly used for pest control in horticulture, reptiles, tarantulas, domestic avian species and poultry flocks. They are naturally found in the UK and Europe, have no reported detrimental effect to insect species, such as honeybees, and have been recorded in honeybee colonies. These mites are 0.5mm long with males being smaller and are found in soil where they natural feed on fungus gnats, thrips, springtails, etc.
Research in Europe has shown that each mite can consume up to 5 preys per day.

2012 Season
It was decided to trial these mites in honeybee colonies but how to apply the mites? Mites were readily available for red mite control, being bred under controlled sterile conditions. The mites are transported in inert vermiculite nest-material stored in a plastic screw top tube, each containing 100ml of nest-material and 5,000 mites. For red mite the contents of each tube is decanted into a dedicated nest box, which has a small exit hole and is placed horizontally close to the junction of poultry shed wall and floor. The mite nest boxes are replenished at six-week intervals but mites must be used within 14 days of supply from the manufacturer or 7 days from a dealer. The honeybee hive environment is not suitable for natural mite reproduction due to high temperature levels, so repeated applications would be required. Two options were available, firstly scattering mites onto the top bars of a colony, they naturally move downwards and secondly, using a purpose designed cartridge as a mite nest box. Though a cartridge for beehives was designed it has not been manufactured.

Predatory mite nest-material is applied to the top bars of the selected colonies. Much of the material and mites fall through to the monitoring board below the mesh floor.

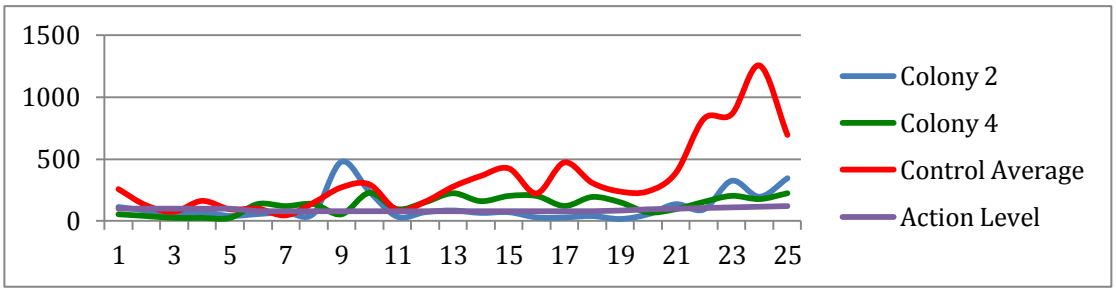
Varroa count was difficult in the first days.

Three apiaries were used for the initial trial two managed by Clare Densley, the Buckfast Abbey Apiarist and a DARG member, and one managed by Richard Ball, DARG Chairman. The Buckfast apiaries were designated as one treated (B) and one untreated as a control (C). In Richard's apiary (A), two colonies were selected randomly for treatment and the remaining colonies left untreated as controls. Varroa mite levels were assessed and recorded daily using open mesh floors and counting mite drop. The predator mites were shaken together with the nest material onto the top bars of the selected hives. A downside of this method is the large amount of nest-material that falls through the hive mesh floors on to the monitoring board and makes varroa mite counting almost impossible for about two days. Floating floor debris in Methylated spirit is ineffective as vermiculite also floats on the surface together with the varroa mites. Two applications of predator mites were made but in one of both Richard's and Clare's colonies at the

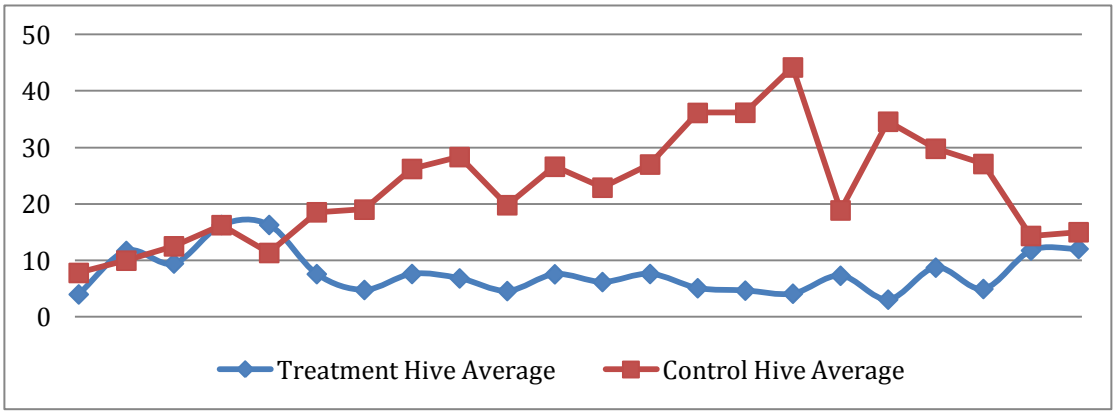
second application a poultry shed applicator was used with the exit hole enlarged to 5/16th of an inch (8mm) and pressed into a brood comb. Bees were observed entering and leaving the applicator removing the nest-material.

Bee leaving the adapted poultry applicator containing the predatory mites and the nest-material

The following graphs show the results obtained. It was felt that the treatments had shown a little promise but needed to be refined and further research carried out.
Predator mites were applied at weeks 8 & 15

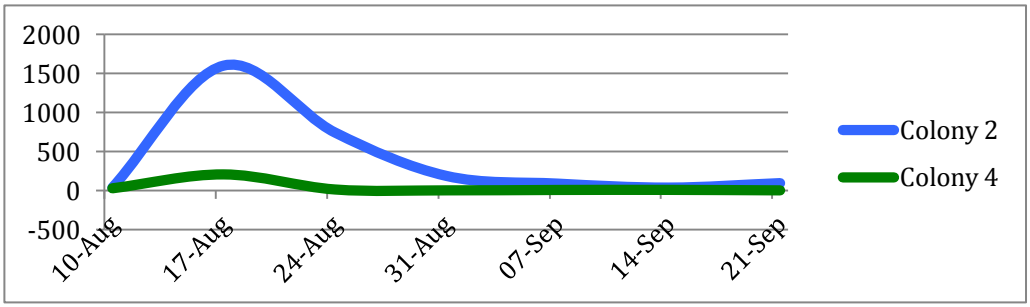


Richards Apiary showing mite population levels.



Buckfast Apiaries showing average daily mite drop

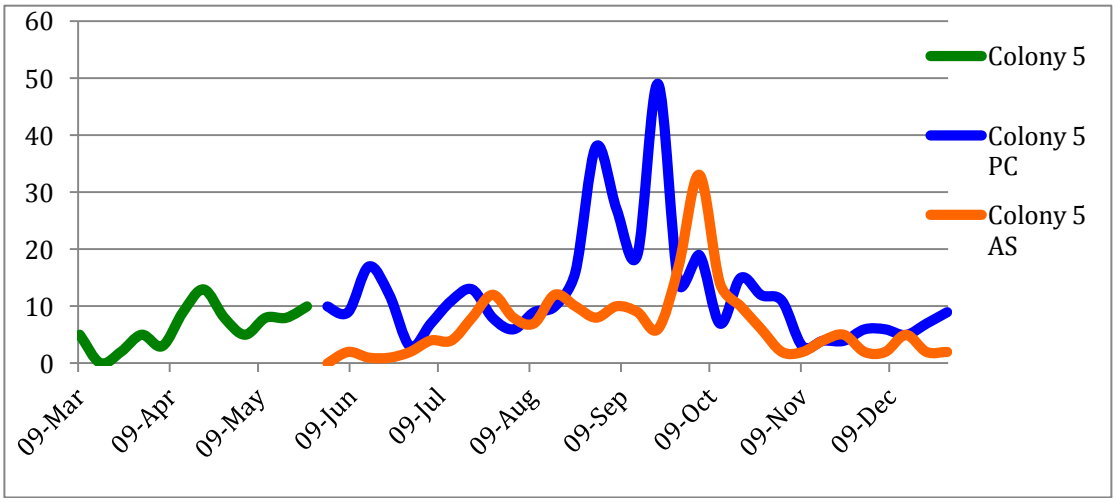
At the end of the season varroacides were applied.
In Richard's Apiary 'Apistan' was used; at Buckfast, 'Apivar'. These products will also destroy any remaining predator mites.



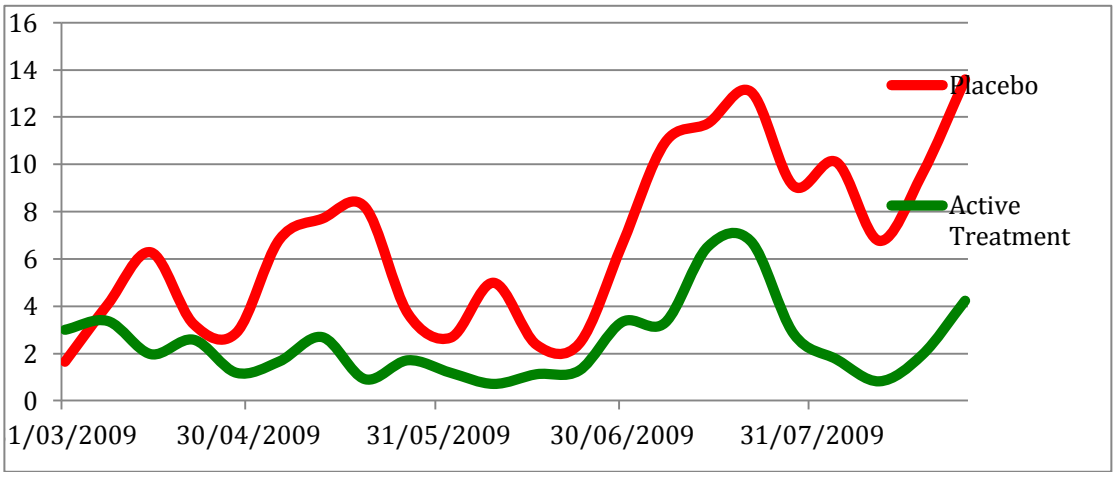
Mite count in Richard's apiary with Apistan treatment.
Mites recovered during the six week treatment:-
Totals for colony 2 – 2,742 mites & colony 4 – 236 mites.

2013 Season
The method of application was changed to paper sachets containing approximately 500 mites. Two sachets were placed on the uppermost top bars of the chosen hives. The sachets were cut or torn open on the top surface to enable the predator mites to go down into the colony. The sachets were marked 'A' or 'B' being either active or a placebo unknown to the apiarist. Analysis gave these results showing daily mite drop. Buckfast trials were carried out in the same two apiaries as 2012. Richard's was limited to one colony, which was later artificially swarmed. Graphs of the data recorded are shown below.

Sachets of predatory mites and medium in place and alternative methods of application.



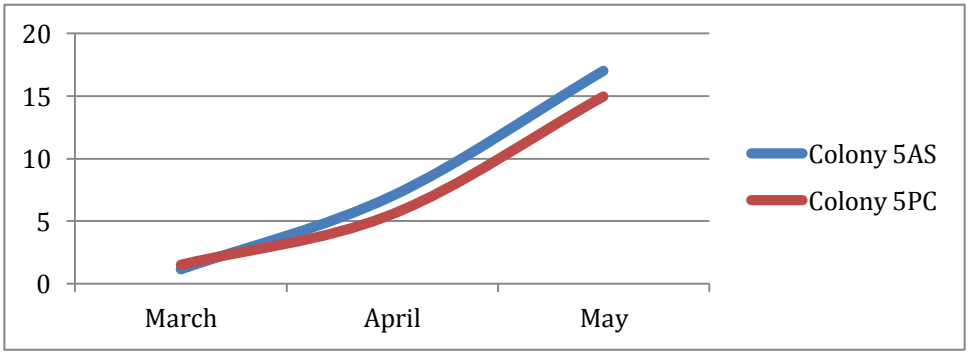
Mite numbers relate to the population in the hive. Predator mite sachets were applied on 10th April, June, August and October. When split the Artificial Swarm (AS) was treated with placebo sachets. Active sachets were applied to Colony 5 and the parent colony(PC).
These colonies were left untreated throughout the winter of 2013-4 as the natural varroa mite drop was low.



Details of the Buckfast data are shown above figures relate to daily mite drop. Predator mites were applied during April, June, August and October

2014 Season

In 2014 predator mites were applied and the graph below gives data collected in Richard's apiary showing daily varroa drop. Due to rising varroa mite levels it was decided to use other varroa controls to get the varroa population back under control. Similar action was taken at Buckfast.



Conclusions.

Both Clare and Richard have concerns in relation to the use of predator mites, which are summarised as follows:

- So far efficacy has been too low to have a significant effect within an Integrated Varroa Management system.
- Can it be improved? Answers to these questions are required.
  - How long do predators remain active in the colony?
  - How many applications?
  - Best times to apply?
  - Are winter applications required?
  - Do predator mites feed on dead varroa mites?
  - Do they prefer to feed on feed varroa mites
- Do predator mites cause damage in a bee colony.
  - Do they feed on bee larvae?
  - Do they prefer to feed on bee larvae?
  - Could this occur if they effectively control varroa and do not have enough to feed on?
- Is it safe to introduce predator mites into a hive?

- What disease issues could be transferred into beehives?
- Can the cost be reduced as it could be a deterrent? A four-sachet application in 2013 had an annual cost per hive of £17. 60. plus postage.

Results so far obtained show that the use of bio-technical varroa control, which are management systems with no chemotherapy used, are considerably more effective.
Work is continuing at Exeter University in respect of these predator mites to answer some of these questions and to obtain good scientific data.

Richard Ball
Clare Densley
February 2015