Sustainable and Bee-friendly Beekeeping

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(Australian Bee Journal, 89(2) Feb 2008, 5-12)

Background

The media has featured honeybee health more than usual lately, largely because of reports from the USA of huge losses of colonies. Random tests on honey show that some beekeepers routinely treat colonies with antibiotics. The worldwide spread of Varroa has forced beekeepers to dose hives with acaricides. And relatively recently in the history of beekeeping, bee disease bureaucracies were set up at public expense. This small selection of bee health phenomena justifies the question: is modern framed-hive beekeeping, spanning little more than a century out of some three millennia of beekeeping, laying the foundations for its own demise?

In case it is, I describe here a bee-friendly way of keeping bees that is arguably healthier as well as being more sustainable in the broadest sense of the term. I hope to encourage readers to experiment with it – as I am doing alongside my hives with frames – and to join a network to exchange experience.

I started beekeeping in 2003 with five 11-frame hives and by 2006 had covered my start-up costs for 20 hives and all equipment. I was just considering starting a top-bar hive experiment when a friend interested in 'bee-appropriate' (*wesensgemäß*) beekeeping sent me a copy of chapters from a book which describes the hive of Abbé Christ (1739-1813). (1)

The main message in that article is that *Nestduftwärmebindung*, i.e. keeping in place the scents and heat of the brood nest, is absolutely essential for optimal colony health. Wild and skep colonies have this characteristic through the sides and top of the combs being fixed to the walls. Inter-comb cul-de-sacs, opening at the bottom, allow the controlled ingress of fresh air, the discharge of CO_2 and the maintenance by the bees of optimal heat and humidity in the nest. The integrity of the almost closed cavities is essential for creating a 'germ-free' atmosphere in the nest. By contrast, hives with so-called moveable frames constantly thwart the bees' efforts to maintain nest integrity, mainly by letting out the nest atmosphere and heat into voids above and beside the frames, and into supers. This stresses bees, increasing honey consumption and risk of disease.

Intrigued by the article's arguments, I decided to experiment with its beekeeping concept. The same friend then told me that the modern equivalent of the Christ hive is that of Abbé Émile Warré (?-1951) and sent me plans of it, which, however, were by Jean-Marie Frèrès and Jean-Claude Guillaume from *L'Apiculture Ecologique de A à Z*, not by Warré himself. (2) Their book has a wealth of meticulously illustrated practical detail about Warré beekeeping, and their hive differs mainly in that each hive-body box has a shuttered window. I made some of these hives in the winter and populated six of them in spring/summer 2006.

Wanting fully to understand Warré's original beekeeping concept, I read his book *L' Apiculture pour Tous*. (3) As it was well worth translating, if only to have handy for quick reference, Pat Cheney and I translated it and published it as *Beekeeping For All* on the Internet. (4) He called his hive The People's Hive.

Warré's beekeeping concept

In his book, Warré recounts:

> "Each winter, all my childhood friends ate an abundance of delicious bread and honey, just as I did. Twenty years later, I was the only person who had beehives. In some gardens, there was an abandoned Dadant or Layens hive, empty of course. The owners had let themselves be tempted by the advertisement of some on displays at agricultural shows. They believed they would do better with these modern hives. In fact they abandoned the only hive that suited them. [...] At my parent's home there was always plenty of honey for masters and workers, even for the farmyard animals. All our friends in the village also had their share each year". (Ref. 2, pp. 35 & 37)

But Warré regarded the practice in skep beekeeping of harvesting honey by sulfuring the bees as barbarous and thus did not advocate returning to 'skeppism'. Instead, he sought a system that was just as simple and economical as skeppism so that bees would once again be commonplace in gardens. The ideal hive had to be

easy to construct by anyone with elementary woodworking skills. The annual management had to require little time, be easy and need minimal and inexpensive equipment. The bees had to winter on their own honey, yet leave a reasonable surplus for the beekeeper. The method had to give rise to docile bees so that people would not be fearful of starting beekeeping.

Construction

A Warré hive is a tiered top-bar hive comprising a stack of at least two boxes each of internal dimensions 300 x 300 x 210 (deep) mm with eight 8 x 24 mm top-bars at 36 mm centres. The floor, a plain board, is notched to form a 120 mm wide entrance and has an alighting board nailed underneath. The internal dimensions of the box resulted from long researches involving the construction of some 350 hives, but are essentially developed from features, such as cavity size and shape as well as the number and dimensions of combs, embodied in the hives of Abbé Voirnot and Georges de Layens.

[Figure 1: Warré hive]

The box walls are at least 20 mm thick; mine 25 mm. The top-bars rest in 10 x 10 mm rebates, but, to ease construction, can just as securely rest on battens nailed 10 mm below the box rim. The bars have a bead of wax or starter-strip fixed to the centre line of their rough-sawn undersides and a coat of linseed oil on the planed upper surfaces. My first boxes had unnecessarily robust jointing. Warré recommends simple butt jointing fixed with nails. Each box has ample, firm handles.

[Figure 2: Hive body/box]

On the top box rests a layer of coarse-weave hessian sacking stiffened with flour paste. Above that is a 100 mm deep box, the *coussin* which we have translated as 'quilt', as this term conveys its function better and is not unfamiliar in this context. The underside of the quilt is covered with sacking and the top left open. It is filled with natural insulating material such as wood shavings, sawdust, straw or dried leaves. Apart from its insulating function this helps control humidity through absorbing excess moisture onto the large area of hydrophilic surface. This probably has a humidity buffering function. There is no condensation in winter.
On the quilt is a wooden ridged roof containing a board to keep mice out of the quilt and a ventilated cavity, which not only reduces solar heating of the top of the hive but also, so I am told, prevents the roof lifting off in strong winds. For various reasons, my first batch of roofs were on a conventional, not Warré, hive pattern, i.e. flat, containing a cavity ventilated in four directions and covered with recycled sheet aluminium. There are two arguments against this pattern. One is that sheet metal has a high carbon footprint and therefore violates a criterion of sustainability. The second is that, according to Warré, the drumming of rain on flat metal-clad roofs disturbs the bees.
Warré discovered that the hive body height of 210 mm, under the conditions of natural comb development, is crucial to the ease of separation of the boxes at harvest. The square box and tall, narrow format results in a brood nest whose dimensions correspond closely to a natural swarm when suspended, and, in approximating to a cylinder, is thermally efficient compared with most modern hives. The unit is reminiscent of a hollow tree with the quilt forming a roof that has a thermal conductivity not too unlike rotting wood.

Management

Basic management needs only two visits a year and on only one of these is the hive really opened. A swarm or artificial swarm of at least 2 kg is introduced at the start of the main nectar flow and, if necessary, fed with diluted honey from the same apiary. Three boxes can be given at the outset to save adding another later.

[Figure 3: Artificial swarming from an 11-frame brood box shortly before removing the 11-frame box: the brood with an advanced queen cell is above and the queen and field bees are in the Warré hive. In between is an adapter board and queen excluder.]

If windows are used, comb growth can be monitored without lifting the hive, otherwise windows are of little observation value, increase the hive's carbon footprint and reduce its cost advantage.

[Figure 4: View through a hive body window (Frèrès & Guillaume modification)]

Comb growth starts in the top box, continues as far as a bee space above the top-bars of the box below and resumes under the bars. An artificial swarm I hived in April 2007 extended to three boxes of comb by the September, similar to the situation shown in Fig. 5, despite it being the worst season in 30 years.

[Figure 5: An acrylic Warré hive, casing removed. Photo: Marc Gatineau (5)]

In a good season, further boxes may have to be inserted underneath. If an assistant is not available, this can be done with a simple fork-lift. (5) Mine was made mostly of scrap, but there was no escaping the £20 outlay for the pulleys and cord. Note that inserting boxes does not involve opening the hive, i.e. does not let the heat out. I have inserted boxes on busy foraging days without needing smoke. The bees seem wholly unconcerned, although Warré recommends smoking the hive entrance at every intervention.

[Figure 6: Gatineau-type fork-lift for Warré hives (5)]

The real hive opening occurs only at harvest, in my locality in late August or early September. The top box is gently loosened with the hive tool. The roof, quilt and cloth are removed and the bees smoked down into the box below. Any wax bridges to the top-bars below are sheared by gentle rotation of the box in both directions and the underside of the comb is inspected for brood. If there is no brood the box is taken for harvest by draining or pressing the comb. If the hive has extended to four boxes, the next box can be examined and removed in the same way provided that 12 kg of honey and two boxes are left for winter: the upper box with mostly honey and the lower with mostly comb and a diminishing brood nest. The rim and top-bars of the upper box are scraped clean, a new cloth fitted, the contents of the quilt renewed, the quilt and roof replaced and a mouse guard affixed for wintering. The wintering situation just described applies to the climate of lowland France. In colder climates, a greater weight of stores may be required, perhaps three boxes and, in extreme cases, insulation and wrapping.
In spring, the mouse guard comes off, a clean floor is substituted and a fresh box or more added underneath the two that overwintered. That is all.

Mobility of combs

Unlike in skeps, this hive is designed for removing comb if the beekeeper wishes. This is particularly important in countries where beekeeping legislation does not allow honeybees to build a bee-appropriate nest, i.e. to fix their comb to the sides of the hive, the importance of which is described above. But as with all top-bar hives, much greater care is called for when removing comb, because the comb attachments to the walls have to be cut with a thin, serrated knife and the comb, fixed to the top-bar, kept vertical at all times. Warré commented on the so-called moveability of framed comb and said that he found cutting through the comb bridges in his hive easier than unsticking propolised frames. Another advantage of removing comb is to have some drawn comb spare for the various standard beekeeping manipulations. Accordingly, Warré describes a simple adapter cage for extracting honey from unframed comb in a tangential extractor. However, reusing comb is not done to the extent that it significantly undermines the brood nest renewal process that is built into the Warré hive concept.
Roger Delon introduced a modification of the Warré hive by inserting a 3 mm thick stainless steel wire in the top-bars so as to pass round the three remaining edges of the comb. (6) This wire is essentially 'invisible' to the bees in that, unlike with wooden frames, they still allow a natural nest with comb touching the walls. Although this counters Warré's aims of simplicity and cheapness – and stainless steel has a high embodied energy – it might be an acceptable temporary help to comb mobility while legislatures are catching up with the ideas of bee-friendly beekeeping.

Swarm control

Swarming is greatly reduced in the Warré hive because of its potentially infinite brood nest expansion and ample space for bees to hang under the developing comb. Most of the manipulations of beekeeping are possible with a Warré hive but only one additional manipulation is mentioned here, namely Warré's 'pioneering method' of swarm control. At the start of the main nectar flow, whether or not hive entrance 'beards' or other phenomena warn of incipient swarming, an entire colony may be artificially swarmed into three fresh boxes, the old brood destroyed, the honey harvested and the wax rendered. A colony with no brood to hold it back generally develops very rapidly and usually gives a honey surplus.

Varroa control

Frèrès and Guillaume recommended that, in combination with the pioneering method of swarm control, the colony spends a short time hanging in a decontaminator box fitted with a fluvalinate strip. With Varroa developing resistance, in the author's region this is no longer an option. Some Warré beekeepers put thymol, for example Apilife Var, in their hives. This risks undoing the whole point of Warré beekeeping, namely letting the bees maintain their health by suitably structuring their home. Reports that Warré hive mite counts are about one tenth those of framed hives in the same locality still need to be verified scientifically. However, several beekeepers are letting their bees co-evolve with Varroa without chemicals. One has three