

# Heater Bees and Brood Nest Warmth

Honey bees are said to be the most intensely researched creatures in the animal kingdom.

As beekeepers we can draw from an astounding wealth of information about the intricacies of colony life. Indeed, successful beekeeping is built upon the close study of colony behaviour. Scientific findings accumulated over the years have contributed to today's vast body of knowledge. However, if it is true that honey bee numbers are continuously declining we must assume that either a lot more knowledge is needed or our existing knowledge needs to be applied in a different way.

In recent years, a lot of fundamental research has been directed at unveiling some of the secrets concerning the warmth regulation in colonies' brood nests. Although a number of researchers have worked in this field and published their findings, the discovery of yet another couple of bee 'professions, in addition to the ones we have been familiar with, is associated with Juergen Tautz. The findings of Tautz and his Wuerzburg university research team were widely reported in the British press (not always entirely accurately) earlier this year.

We now know that there are two additional activities, or 'jobs' carried out by specific bees within the hive. Using thermal imaging apparatus it was established that certain bees which are found in empty cells (between 10-20%) on otherwise sealed brood combs in the nest fulfil an absolutely vital task: they are maintaining the crucial brood nest temperature of about 35°C, and their efforts are fine tuned to the heating work performed by other bees on the comb. A central heating system par excellence! It was previously thought that the bees observed in this behaviour were cleaning, or resting. In fact, efforts were made by bee breeders to eliminate this 'undesirable' queen trait of leaving cells empty on the comb. It has now been established that the bees lying head first in these empty cells are working extremely hard for the good of the colony! So hard that they are totally

exhausted after thirty minutes of engaging in bursts of pumping movements of their abdomens, thereby raising their body temperature to up to 43°C. This has the effect of imparting extra warmth to roughly seventy pupae in the surrounding closed cells. It was also found that bees engaged in this activity belong to no particular age class but can be between 3 and 27 days old. And to spare them the burden of walking to the nearest honey stores, other bees will bring the necessary fuel to them. This group of bees, termed the 'filling station' bees by Tautz, find the exhausted heater bees in the dark of the nest by means of the temperature sensitive receptors on their antennae and feed them highly concentrated honey. Another impressive example of outstanding team work undertaken to ensure the essential warmth of the brood nest. There is a lot more to this research which is compelling reading, such as the effects of different pupal development temperatures on behaviour, performance and sensitivity of the adult bees. It is to the great credit of Juergen Tautz that he has described his findings in a way that the interested lay person can understand<sup>1</sup>.

As beekeepers we can be very grateful indeed for these new perspectives. Are we ready to face their implications? If nothing else, this research clearly sets out the amazing amount of effort and energy that is expended by a honey bee colony to maintain the necessary warmth of the brood nest. It must be essential to healthy colony life to do this. Unlike us, bees do nothing without purpose. Extraordinarily sophisticated feedback mechanisms are deployed by the super organism to ensure constant adaptation to ambient conditions. Of course, most beekeepers are aware that the brood needs to be kept warm, and most beginners will be told fairly early on in their beekeeping adventure that it is not a good idea to 'chill' the brood. Everyone who engages in inspections of the brood nest will have felt and smelled the

fragrant warmth rising from the depths of the hive as it is opened. Nevertheless, beekeeping literature is mostly silent on the subject of brood nest warmth. This may change as the vital importance of brood nest warmth is recognised.

Having been peripherally involved with the manuscript of a new book for beekeepers by David Heaf, which is due to be published by Northern Bee Books in autumn this year, I am very pleased to be able to tell you that the subject of warmth maintenance in the hive is given due consideration.

As interest in feral colonies is growing, and it is noted that they appear to be surviving without the help of beekeepers, we might be well advised to ask what they have that our beekeeper kept colonies do not. In previous issues of BBKA News Craig Exley reported his own observations and conclusions regarding the survival of feral colonies which prompted him to advocate ways of beekeeping that are in closer harmony with the needs of the bees<sup>2</sup>; it was generally assumed then that feral colonies could not survive the depredations of the varroa mite. His experience was otherwise. As we await the results of the Bangor University research project recently announced in the press, we might ponder the issues concerning the health of feral colonies in the light of our own beekeeping practices. "The fact that these feral colonies can survive without medication and feeding by beekeepers suggest that they may be a source of very useful genes", Dr. Malhotra of Bangor university is quoted to say about the new research project which will be carried out in association with a Welsh Bee Breeding project. It is to be hoped that the possible connection between 'useful genes' and undisturbed brood nest integrity as well as swarming might also be investigated.

If we, as people interested in the welfare of the honey bee, take to heart what we have had the privilege to learn about 'heater bees' we might consider some of our own beekeeping practice from the point of view of helping or hindering the colony's essential task of maintaining the warmth of the hive. This should certainly include a hard look at the kind of homes we expect them to live in. There can be no doubt that some hive designs are more conducive to warmth maintenance than others. The same can be said for different modes of bee husbandry. We might feel inspired by what we are learning about the intricacies of the bees' warmth organism to consider the following: Are we not likely to undermine countless heater bees' efforts every time we intrude into the nest? Naturally, there are compelling reasons, at times, to carry out a full scale inspection of brood combs. But these are relatively rare. Is it not true that many an inspection of colonies is rather voyeuristic and self serving? There is mounting evidence to suggest that our honey bees are overworked, undernourished and stressed. We are also becoming increasingly aware that bees here and elsewhere in the Western world struggle to cope with pesticides and other man made ills in the environment. Maybe the new insights into the work of the heater bees holds the key to encouraging us to support actively and consciously the bees' miraculous efforts to control *their own* hive environment. Allowing them to raise their brood at the right temperature without the stress caused by unnecessary nest intrusions might be a step towards that.

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1 J. Tautz, The Buzz about Bees  
2 Craig Exley, Seeking a Baseline, BBKA News

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