ROTHAMSTED RESEARCH

The Cause and Control of Swarming in Bees

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THE CAUSE AND CONTROL OF SWARMING IN BEES

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ROTHAMSTED EXPERIMENTAL STATION

Gertsung's Brood Food Theory

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GERSTUNG'S BROOD FOOD THEORY

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Dr. Gerstung endeavours to explain the mysterious phenomena of the life-cycle of a colony of bees by comparing it to a plant, rather than to a more highly organised animal. He maintains that just as a plant originates from one germ out of which the diversity of cells —roots, stalk or stem, bud, flower and fruit—develop, and as each group of cells performs its allotted task, and as the parts depend upon and derive life from the whole, so too in a similar way do the various members of a colony of bees originate and subsist. A branch cut from a tree is bound to wither, so likewise individual members, apart from the colony, cannot exist for any length of time. Queen, drone and worker each performs the duty it is designed for by Nature towards the upkeep and propagation of the species, and in turn each unit derives and relies on the existence of the whole.

A colony of bees therefore is, according to Gerstung's views, an organism the existence of which is dependent on the concordant co-operation of the various units, and existence of the units presupposes the whole as source and bearer of life.

Dr. Gerstung's organic conception has a direct relation to all aspects of colony-life. However, we are concerned with it only as it relates to swarming.

In English literature on beekeeping Gerstung's name is mainly associated with what is termed "the brood food theory." The brood food theory is a logical development of the aforementioned " organic conception."

Dr. Gerstung sees in brood food the primary source and stimulus of all the phenomena that take place in the life-cycle of a colony, and draws a parallel between brood food and the sap circulating in a tree. During the dormant season only enough sap is generated to sustain life, but when, in response to warmth, more of the life-giving element is produced than is demanded for subsistence, growth and all the diverse forms of seasonal development are, one by one, set in action ; leaves, buds, flowers and fruit succeed each other in due order. So too, Gerstung maintains, does brood food play a similar role in the life of a colony. A continuous flow and exchange of brood food takes place among nurse and field bees, and a flow from the former to queen and drones ; each caste, every section of the worker population draws from the brood food stream, " Futtersaftstrom," the particular sustenance it requires. The rising intensity of the brood food flow sets

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one instinct after another into motion. In the first instance the reproductive, then the drone-raising instinct; the comb-building instinct; and, finally, when the greatest intensity of the flow is reached, the propagative instinct. The succeeding phases of development are only attained if the brood food flow exceeds the demand made on it at the time; conversely, the moment the flow declines, the propagative impulse, the drone-raising impulse, the building-impulse, and eventually the reproductive impulse recede into abeyance.

The actual conditions usually leading to swarming come about as follows. Until nectar is available a steady increase in nurse bees, and a corresponding extension of the brood nest takes place normally, provided no shortage of stores or prolonged cold spells check the development. But at the time when the first nectar is gathered a tremendous spurt of brood rearing generally occurs, and the queen is forced to lay to her maximum capacity. Indeed, at this period the area of brood is often doubled and trebled in the space of a few weeks. Now, according to Gerstung, the critical stage as regards swarming is reached the moment this horde of emerging bees assumes the duty of nurses. On the one hand the queen has attained the limit of her egg-laying capacity, and on the other hand the emerging bees are capable of providing brood food for at least twice the number of eggs the queen can produce. There is only one further outlet for an overproduction of chyle—royal larvae. Queen cells are accordingly constructed and the swarming impulse and the swarming fever aroused.

This, briefly summarised, is Gerstung's brood food theory. It is a hypothesis only, as the author himself affirmed; but a hypothesis possessing the greatest element of probability.

Speaking from my own observations and experience in handling almost every known variety of bees, I have been led to the conclusion that the brood food theory is the only satisfactory explanation of the cause of swarming so far put forward. Lack of room, insufficient ventilation, congestion of the brood chamber are merely secondary influences. Indeed, too much room and ventilation more often than not inhibit normal expansion of the brood nest, the ratio of nurse bees to brood becomes unbalanced, and swarming caused in consequence.

One vital aspect of Gerstung's theory is, I believe, often overlooked, namely, that the presence of a preponderance of bees of nursing age does not itself induce swarming; it only gives rise to the swarming impulse if the bees are excited to an overproduction of brood food. In other words, if by one influence or another the energies of young bees is diverted into other spheres of occupation than the elaboration of brood food, then no swarming will occur. It must be borne in mind that bees possess the ability of adapting their activities to the needs of the moment. Were it not for this fact

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then swarming would be bound to develop in every colony the moment a queen reaches her maximum egg-laying capacity, or at the time breeding declines. If the attention of a section of the young bees of a colony is centred on other activities than nursing brood, they will pass then the nursing stage of their life without ever taking an active part in the preparation of brood food.

One obvious conclusion that may be inferred from Gerstung's hypothesis is that colonies which develop gradually from the time breeding commences until the height of the season is reached, and which are in no way and at no time checked in their development, are the ones least susceptible to swarming.

The Buckfast System of Swarm Control

Swarm preventitive measures possess an inherent element of uncertainty, unreliability on account of the manifold influences beyond our control to which bees are subject. Moreover, the various strains, and even individual colonies of the same strain, react often quite differently to identical treatment. We have therefore at Buckfast adopted a system of swarm control which I will now outline.

All honey producing stocks are re-queened annually. Queens two years old fail all too frequently at the height of the brood-rearing season, and thereby induce swarming. Every queen before being introduced into a stock has one of her wings clipped. Unrestricted breeding-space, and an abundance of stores is provided so that at no time is normal development of a colony checked.

Throughout the swarming season each colony is examined at intervals of ten days. On the first occasion a colony is found preparing to swarm we merely remove all queen cells. If, however, queen cells are again present on the subsequent visit, then this is taken as a definite indication that that colony is determined to swarm. The queen is therefore removed and every queen cell searched for and destroyed, and the colony thus left until the next visit. On the subsequent round all the queen cells possessed by the queenless stocks are once more removed, and then given a young fertile queen. Colonies thus re-queened, after being without a fertile queen for ten days, can be relied on not to swarm again for that season.

Were it not for the fact that all our stocks are taken on to Dartmoor in August for the heather harvest we would, regardless whether preparations for swarming are in progress or not, de-queen every colony about June 15th-20th, and re-queen them ten days after. The advantages derived from this form of swarm control are :—

(1) Swarming is prevented absolutely, with the least possible expenditure of time and labour per colony.

(2) Stocks are kept undivided.

(3) Colonies thus re-queened, just prior to the main honey flow, work well-nigh with as great energy as newly hived natural swarms.

(4) Breeding is suspended at a time when, in most districts, it

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would be a disadvantage. (Bees which emerge after July 1st attain maturity too late to take an active share in gathering honey, and therefore subsist on stores laid up for winter.)

(5) A break in breeding at the height of the season is the most effective check and remedy to all milder forms of brood and adult bee diseases.

Unfortunately, where heather honey aimed at, the aforementioned periodical examination of colonies seems inevitable. A colony made queenless in June is quite useless for the production of a surplus in August.

There is one detail of management I would like to draw particular attention to, as it has an important bearing on swarming, namely, at no time during the swarming season do we alter the position of combs in the brood chamber, or disturb the ordered arrangement of the bees more than can possibly be helped. A disorganisation at this period beyond any doubt tends to induce swarming.

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