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The phenomenon of *Apis mellifera capensis* laying workers in *Apis mellifera scutellata* colonies in the summer rainfall region of South Africa

by

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ABSTRACT

African honeybee workers, *Apis mellifera scutellata* can activate their ovaries under queenless conditions to produce male (haploid) offspring. In contrast, laying workers of the Cape honeybee, *Apis mellifera capensis,* produce female (diploid) offspring via thelytokous parthenogenesis. In the early 1990's colonies of *A. m. capensis* were transported into the distribution area of *A. m. scutellata* (corresponding to the summer rainfall region of South Africa), leading to the "capensis calamity". Laying workers of *A. m. capensis* invaded and killed colonies of *A. m. scutellata* leading to losses of thousands of commercial colonies.

A survey of the apiaries in the *A. m. scutellata* region was conducted over 18 months from 1997 to 1998, to determine the extent of the problem. It was found that the parasites were established in many apiaries throughout the distribution range of *A. m. scutellata*. As the problem seemed to be more severe with commercial and migratory beekeepers, the apiaries surveyed were divided into risk groups related to beekeeping practices. The low risk group included apiaries of beekeepers in areas that are separated from commercial beekeepers and their high risk activities. These low risk colonies were sedentary vs the migration to high risk ares eg. Aloes, sunflower pollination areas, citrus and other fruit pollination areas of the high risk apairies.

The apiaries were monitored and records of the colonies' condition were taken. Samples of workers were collected for dissection. It was found that the low risk group had a lower rate of infection, a higher production of brood and honey and a higher rate of survival over a 12 month period.

The significant characteristics for identifying infection of a colony were determined as being the colour of the workers, the brood pattern, the presence of multiple eggs in cells and the presence of the queen. Indeed, the presence of dark workers with a black scutellum, an irregular brood pattern, the presence of

multiple eggs in cells and the absence of queen were all prevalent in infected colonies. As sample of workers from all inspected colonies were dissected and the average ovariole counts as well of the development stage of the ovaries proved to be significant variables in the diagnosis. Other variables eg. Ovariole counts, spermatheca size and aggression proved to be not significant, but in conjunction with other variables, could be used for diagnosis.

The genetic nature of the invasive parasitic population was determined using polymerase chain reaction (PCR) analysis. Nine loci were tested and the DNA fingerprints of all individuals sampled throughout the summer rainfall region were proved to be identical. This genetic identity led to the descripter of these individuals as a pseudoclone. In contrast, workers of *A. m. scutellata* were tested with the same loci and showed the normal distribution of an out-breeding population.

In order to investigate the spread of the parasite within an apiary, colonies were exposed to heavily infected hives and inspected regularly. Ninety five percent of the colonies had either died or absconded within 12 months.

It is concluded that this phenomenon of social parasitism is the consequence of apicaultural activities and that it can be managed by adopting low risk beekeeping practices.

FRONTICEPIECE

Figure showing *Apis mellifera scutellata* workers with a queen.

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