BIOLOGY AND MANAGEMENT OF AFRICAN BEES *APIS MELLIFERA ADANSONII* IN AFRICA

J. WOYKE
POLAND

Introduction

I have been working with the Africanized bees for 7 months in the region of Ribeirão Preto, Brazil, in the period of 1957 — 1958. Mostly, the bees presented the cross between two races: the Italian *Apis mellifera ligustica* and the African one, *Apis mellifera scutelata.* During the last years I have been working with the African bees in several African countries. There are some clear differences between the African bee and the Africanized ones. The present study gives some observations conducted on the African bees, *A.m.adansonii,* in Ghana.

Absconding

In many African countries the bees are kept in the Kenyan top bar hives. No doubt, the most serious problem concerning the African bees is the tendency to abscond. This character hinders the introduction of a modern intensive management of the bee colonies. The bee colonies absconded even after the hive was opened for the search of the queen, but the queen was not removed. In another situation, bees absconded after a brood comb was taken twice for grafting the larvae for queen rearing, subsequently returning those combs. Twice it happened that bees absconded when a queen in cage was introduced to queenless colonies (one normal and the other one nucleus). Bee colonies also absconded when some bee brood or worker bee were taken away to create new small nuclei of bee colonies. Artificial multiplication of the bee colonies is perhaps possible during the swarming season, and absconding tendency may be lower during a better honey flow. Up to now, the phenomena occurring in the colonies before absconding were not described. However, it is very important to know when the colony is preparing to abscond as some steps may be undertaken to prevent this. It was found that bees, before absconding, eat most of their food reserves. But, most surprisingly, they eat all the larvae. They also open the sealed brood with white pupae and eat them. When a new comb with brood was introduced into the hive, the bees ate all the brood within two days. The queen also stops laying eggs. The colony waits few days until all or most of the workers emerge

from the oldest dark pupae, and then it absconds. The youngest worker bees still cannot fly, and they are left crawling on the ground after the colony absconded.

After the colony was fed on sugar syrup, it was possible to induce the queen to start to lay eggs again. Suitable queen excluders fixed to the entrances also prevented the queens to abscond and the worker bees returned to their hives in several cases. But sometimes, the bees absconded and left their queen behind. Several times the bees did not uptake the syrup offered to them in a feeder, inside the hive.

Determination of swarming or migration season

In the period of May — June, many empty hives were colonized. This part of the year was considered to be the swarming season. However, the nectar and pollen flow was so scarce that it was hard to admit that this was indeed the swarming season. Examination of old and/or new colonies during the end of May and beginning of June revealed the absence of drone brood and adult drones, as well as the absence of queen cells. Consequently, this time of the year which was believed to be the minor swarming season was found to be the migration season. Compared to the swarming bees, migrating colonies must be managed differently. The latter requires more care and, if possible, should be fed with sugar syrup. Of course, queen rearing cannot be conducted during that period, but during the real swarming season only.

Split of brood nest or its improper position in the Kenyan top bar hives

Usually, the bees rear the brood in combs near the entrance and store the honey in combs far away from it. When the entrance is in the middle of the long side of the Kenyan top bar hives (KTB), honey is stored in the last combs on both sides of the hive, and when the entrance is in the front gable-wall, honey is stored in the last hind combs. In both the cases it is easy to harvest combs containing honey exclusively.

During the inspection of the bee colonies in Ghana it was found for several times that the combs containing some honey and pollen were located in the middle of the nest, near the entrance, while the brood was reared in the last combs, on one or both sides of the nest.

In the beginning it was so believed that double entrances in the long side wall, found in some KTB hives were responsible for this unusual placement or split of the brood nest. However, later on, the brood nest was also found to be located in the rear of the hive, when the entrance was just in the opposite front gable wall. In this case

sealed honey was located above the brood. So, it was impossible to harvest combs containing honey exclusively.

Later on was found that the reason for the unproper place of brood rearing in the hive was the method of managing the bees. Honey is mostly harvested at night, from the last combs. The central part of the nest remains untouched. After several generations of bees are reared here, the remains of the cocoons make the combs very dark and the cells are too small to rear bees in them. So, the queen shifts egg laying into the new combs on both sides/or on the rear of the hive.

In order to get the brood nest in the proper position and honey in the last combs exclusively, the position of the combs must be rearranged by locating the new combs in the centre or near the entrance.

Start and end of flight activity

During the night, the worker bees created a small cluster in front of the hive entrance. It is still dark when the bees start to dissolve the cluster and fly out. Their behaviour differs from that during the day. The bees do not fly out directly from the entrance, but crawl at first up, on the front wall. In summer (June), during the rainy season, some bees start to walk out of the cluster at 5.00 to 5.10, when it is still dark. Some of the crawling bees start to fly out at 5.15, half an hour before the sun rise. Returning bees also land on the front wall and then walk to the entrance. In the meantime, it gets a little lighter. Records of the flight could be read at 5.30. The sun rises at 5.40 — 5.45. By then, the cluster before the entrance is dissolved, and the bees fly out and return to the hive directly from or to the entrance or the alighting board. At 5.45 returning bees are well visible and it is possible to start counting them.

In the evening, the sunset occurs at 18.20 — 18.25. Practically, around 18.35 the bees stop to fly. The last bees return when it is already dark, landing on the front wall of the hive and then walking to the entrance. At this time, the bees start to create the cluster before the entrance. At 18.45 is difficult to read the records of flight and at 18.55 is so dark, that it is impossible to read anything.

In the winter (December — February), during the dry season, all the phenomena occurred in the morning about 10 minutes later, and in the evening about 10 minutes earlier.

Foraging activity

The investigations were conducted in three different zones of Ghana: in the costal zone in Accra, in the south-central zone of the deciduous forest in Kumasi and in the northern savanna zone in Tamale. The investigations were carried out during the dry season (December — February), as well as during the

rainy season (June — July). The same colony was investigated in each zone, during both seasons.

Two peaks of foraging activity occurred during the dry season; one in the morning, between 6.00 — 6.15 hrs., shortly after sunrise and the other in the evening, between 17.00 — 18.00 hrs., shortly before sunset. In the beginning of the dry season, the evening peak of flight activity was higher than the morning one. Later on, the morning peak was higher than the evening one. During the rainy season, the pattern of the foraging activity changed. Only one morning peak occurred at 6.00 hrs. But, the morning peak of foraging activity in the northern savanna region was shifted till 9.00 hrs. Foraging activity during midday, in the warm period of the day, was always low.

Protective bee gloves as stimulators of bee stings

Protective clothing, especially bee veil and gloves are recommended to be worn while working with the African bees. However, it was found that the gloves can stimulate bee stinging. Gloves used in Ghana are produced of grey leather. The part which covered the hands had the smooth leather side inside, but the cuffs had the rough side outside. I inspected bee colonies with the assistance of three beekeepers. My gloves were left in the pocket of a hand bag, two of my assistants wore those gloves and the third had plastic gloves, smooth all over. Shortly after the first hive was opened, the bees started to sting the cuffs of the leather gloves, and with each second they increased their furious attacks. We could finish the work with the first colony, but it was impossible to finish the work with the second one. My unprotected hands had only few stings, but the cuffs of the leather gloves of my assistants were completely covered by stings, as well as the cuffs of the two gloves in my hand bag. However, the plastic smooth gloves were free of stings.

Stings left in one cuff were counted, amounting to a number of 700 stings. This means that the worker bees left in the cuffs of all six gloves about 4,200 stings. Such a large number of stings left behind released an enormous amount of alarm pheromone and alerted the bees to sting more and more. As a result, the bees followed us for a distance of 300 m. Nobody could pass nearby.

Next, the cuffs were reserved with the smooth side outside. After two days, the colonies in the same apiary were inspected. Now, the bees did not sting the cuffs of the gloves, neither on the hands of the assitants, nor in the hand bag. My unprotected hands had only one sting. Later on, it was possible to work with the same colonies, without any smoke and without any protection of bee veil, gloves and even without a shirt.

Aggressiveness

A leather ball (diameter of 7 cm) was suspended for 1 minute, 50 cm away from the entrance of the hive. The worker bees stung that ball leaving the stings behind. The stings which were left were later removed and counted. The experiment was conducted every hour from 6 a.m. until 6 p.m.

The results obtained have shown that high variation of aggressiveness occurred during the day. Very high correlation was found to exist between foraging activity and aggressiveness (correlation coeficient, r = 0.9). When more bees were flying, more were stinging. Differences in aggressiveness of the same bee colony occurred also during various seasons. While 22% of foragers were stinging during the rainy season (23 and 24 of June), as many as 81% of foragers were stinging during the dry season (13 January). Interaction occurs also between stinging and the season.

High variation in aggressiveness was found to exist between different colonies (mean 26 — 97 sting/min.). Very often bees from strong colonies stung more than those from the weak colonies. Thus, the absolute number of stings does not reflect the genetic potential of the character. Therefore, the percentage of stinging bees was calculated in relation to the foraging ones. The variation ranged from 31 — 192%. Thus, in the most aggressive colony the number of stinging bees was twice as high as that of the foraging one. This percentage of aggressiveness should be used in selection of gentle bees.

After the conditions of the stinging bees were known and proper management was used, it was possible to work without any protection, without shirt and even without the smoke with the same colony, with which earlier it was impossible to work even with heavy protection.

Author's Address:
J. WOYKE
Bee Culture Division,
Agricultural University — SGGW,
02 — 766 Warsaw
166 Nowoursynowska str., Poland