

**An Investigation of the Migration of Africanized Honey Bees
into the Southern United States**

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Introduction

It is estimated that *Apis mellifera scutellata*, a honey bee subspecies from Africa, now extends over a 20 million square kilometer range that includes much of South America and practically all of Central America, and recently has been introduced to the southern United States. African honeybees were introduced into Brazil in 1956 by a Brazilian geneticist, Mr. Warwick Kerr. At the insistence of the Brazilian Ministry of Agriculture, in 1957, 26 colonies were accidentally released in a eucalyptus forest outside São Paulo. The swelling front of the bees was recorded as traveling between 80 and 500 kilometers a year. David Roubik, one of the original killer bee team members estimated that there were one trillion individual Africanized/African honey bees in Latin America. An estimate that is thought to be conservative.

Behavioral Characteristics

Honey bees are not native to the Americas and were introduced during the 1600's by settlers, hence the name European Honey Bees, *Apis mellifera ligustica* (EHB). The freed honey bees and their progeny encountered a hospitable dwelling in Brazil and flourished, in contrast to the EHB that did not fare as well due to their introduction from a much milder climatic background. The behavioral characteristics that distinguish the two species are swarming and absconding. Swarming occurs when the queen and many hive members break off to form a new colony, and leave the original colony with a young queen, who repopulates the hive. EHB's swarm perhaps once a year, whereas African bees swarm frequently when flowers are abundant. Absconding is when African honey bees gather honey in the nest and abandon the hive en masse and scout for a more suitable locale, in contrast to EHB's which rarely abscond. Since European and Africanized honey bees are members of the same species *A. mellifera*, they interbreed freely. This has enabled the African bee to do well genetically. The original 26 colonies released represented a bottle neck effect for the introduced bees, where available allelic variations would theoretically lead to extirpation, yet the EHB mating with the African honey bee, hybridized to form an Africanized Honey Bee (AHB). This interbreeding has been detrimental to the EHB population, and has provided the African stock with more genetic variability. Bees that carry a genetic code from the African bee subspecies that are found in the nests of the EHB tend to disrupt hive activity because of the swarming and absconding nature of African bees. Evolutionary pressures for *A. m. scutellata*, include apivorous animals such as man, birds, lizards, badgers etc. as well as nectar availability and climatic factors. Another characteristic commonly known by the public is the excessive level of colony defense by the AHB. All honey bees respond to what they perceive as threats to the nest, however, AHB do so more readily and more vigorously than EHB. The honey bees react to an alarm pheromone called an alarm odor, which is triggered by threats such as vibrations and rapid movement. Once a bee stings it leaves behind its intestines which releases the alarm odor. AHB react in higher numbers than do the EHB and at much longer distances. In Mexico over 1,000 stings, which include 58 human deaths, and many domesticated animals have been reported up to 1991. It is important to recognize that AHB colonies are unpredictable and have a greater potential for excessive stinging.

Migration Patterns

The migration of AHB from its introduction outside São Paulo to the United States was completed in less than 35 years. Migration of AHB's farmed out in all directions, and AHB's began to attract attention for its intense nest defense, and frequent nature of absconding and swarming. Scientists are still questioning how far north the AHB will survive in the United States, as they have the ability to survive different climates. One of the first recordings in the U.S. of these insects was on the southern tip of Texas, in October 15, 1990.

Managed and feral honey bee colonies harvest large quantities of nectar and pollen within kilometers of their nesting sites. These bees are highly developed foraging machines that pollinate many types of plants, including vegetables, fruit trees and flowers. They produce honey and one third of our daily diet from crops that are pollinated through entomophily, by honey bees. Impact on American beekeeping and agriculture from the migrating AHB is unpredictable and is dependent on apicultrists being able to be reactive to the AHB introduction into the southern U.S. Beekeeper that adapt to new conditions will be able to do better and prosper. Some suggested responses involve Quarantines of colonies that must now be regulated, Requeening annually to be assured that apiaries are free of African genetic influence, Training of Beekeeping Hobbyist to ensure safety and African free bee nests, and finally Public health and education awareness programs since there is potential danger from AHB's.

The Killer Bee Research Group at the Pan American Center for Earth and Environmental Studies is developing a geographical information system to assist in the monitoring of the northward migration of the AHB. The geographical information system is a computerized database system containing several layers of data related to factors which influence the spread of the AHB. These data layers are in turn referenced geographically to a base map which provides a natural visualization of the complex interactions among factors influencing bee migration. Remotely sensed data from the Advanced Very High Resolution Radiometer is being processed and entered into the geographical information system. A companion work in this conference [4] addresses the technical aspects surrounding the development of the geographical information system.

Economic Impact

Estimates according to the U.S. Department of Agriculture concerning the overall impact of AHB migration on beekeeping and crop production range from \$26 million to \$58 million annually for beekeeping alone, Annual crop losses are estimated at \$93 million. In some parts of Central America, unmanaged AHB reduced honey production of domestic bees by 60 to 70 percent or more, due to competition of available nectar. This will also impact other bee products which include wax, pollination rental of bees and packaged bees.

Summary and Future Work

The distribution of the AHB in the United States depends on many factors such as ultimate levels of hybridization with existing populations, domestic and feral. Where in the U.S. the northern limit of the AHB will lie is still a matter for extensive speculation. Many studies remain to be done where conclusive trends and scenarios can be understood, regarding the potential range of the AHB in the U.S.

Acknowledgment

I wish to thank NASA for its support of this project through the grant NCCW-0089. Also, I wish to extend gratitude to Byron Wood and Louisa Beck of the Center for Health Applications of Aerospace and Related Technologies at NASA Ames Research Center for their assistance in the formulation of this project.

References

- [1] Winston, Mark, Killer Bees, Cambridge, MA: Harvard University Press, 1992.
- [2] W. G. Hale and J.P. Margham, Biology, New York: Harper Perennial, 1991.
- [3] Laidlaw, Harry H., Queen Rearing, Hamilton, IL: Dadant & Sons, Inc., 1950.
- [4] Ward, C. *et.al.*, "The Integration of Geographical Information Systems and Remotely Sensed Data to Track and Predict the Migration Path of the Africanized Honey Bee," Proc. of the 1997 NASA URC-TC '97 National Conference on Education. Aeronautics, Space, Autonomy, Earth and Environment, Albuquerque, NM, Feb. 1997.