

Project No. 93-G7 - Africanized Honey Bees

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Cooperating Personnel: None

- Objectives:**
1. Develop methods to maintain and produce commercial honey bee stocks that are free from the influence of africanization.
 2. Develop programs that will allow selective breeding and stock improvement of resident honey bee populations following africanization.
 3. Determine the efficacy of and develop methods for improving the genetic composition of feral honey bee populations following africanization.
 4. Develop improved methods for analyzing mitochondrial and nuclear DNA in order to determine the range and degree of africanization throughout California.
 5. Develop better breeding techniques including instrumental insemination.
 6. Develop new apicultural practices for commercial beekeeping.
 7. Conduct research that will contribute to a better (more informed) understanding of africanized bee biology and behavior.

Results:

High Pollen Hoarding Stocks

More than 1,000 queens were produced from generation 4 of our high pollen hoarding strain of honey bees. These queens were marked with paint, distributed to cooperating beekeepers, and introduced into colonies in April 1992. Colonies were moved into alfalfa fields in May, overwintered in the Central Valley, then moved into almond orchards for 1993 Spring pollination. Colonies were examined periodically to determine queen survival. Forty-nine percent of queens failed to be accepted into colonies. This varied from 20 to 91%, depending on the beekeeper. Sixty-one percent of the queens that survived introduction died before the end of February, leaving only 37% of the original queens introduced 10 months earlier. Colonies with high strain queens had significantly more bees than similarly managed commercial colonies, when evaluated in February prior to almond bloom (see Fig. 1).

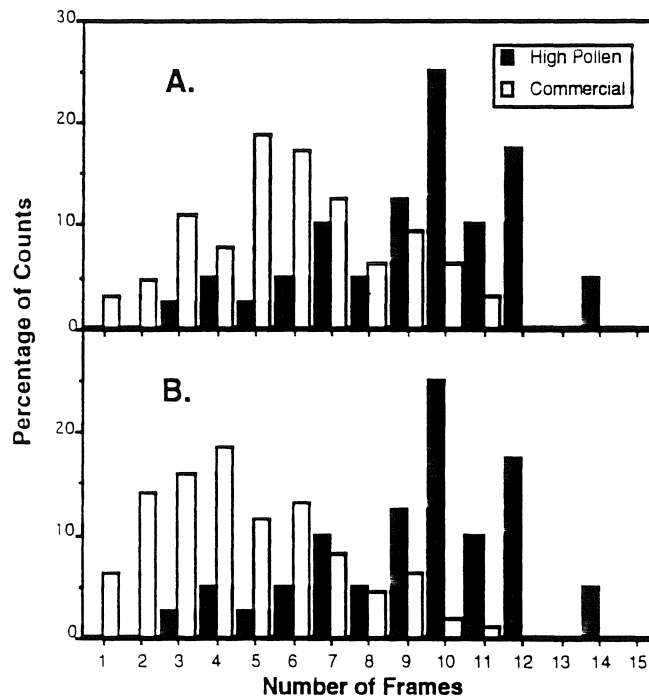


Figure 1. The distribution of high pollen strain and commercial colonies for frames of bees evaluated in almond orchards in February, 1993. Commercial and high strain colonies in 1A were managed together throughout the season. Commercial colonies in 1B were not managed with high strain colonies and came from orchards located nearby our test apiaries.

These results demonstrate that requeening on an annual basis may be insufficient to maintain European honey bees following Africanization of the feral bees in California. Queen loss results in queen replacement. New queens mate while in flight away from the apiary and are likely to encounter and mate with Africanized males. These results also suggest that the high pollen hoarding strains of honey bees may have commercially desirable characteristics in addition to their high pollen collecting behavior.

Identification and Behavior of Africanized Bees

We have been monitoring the progressive Africanization of a beekeeping operation located in Ixtapan de la Sal, Mexico. This area became Africanized in 1990. Africanized honey bees are smaller than Europeans and have measurably smaller-sized wings. We measured average wing lengths in colonies and tested colonies for defensive behavior. We have also developed a diagnostic test for mitochondrial DNA that can distinguish mitochondria that come from eastern and western European races of honey bees from those originating in Africa. Most feral Africanized bees have distinguishable African-type mitochondria. We examined the relationships between forewing length, stinging behavior, and mitochondrial type (Fig. 2).

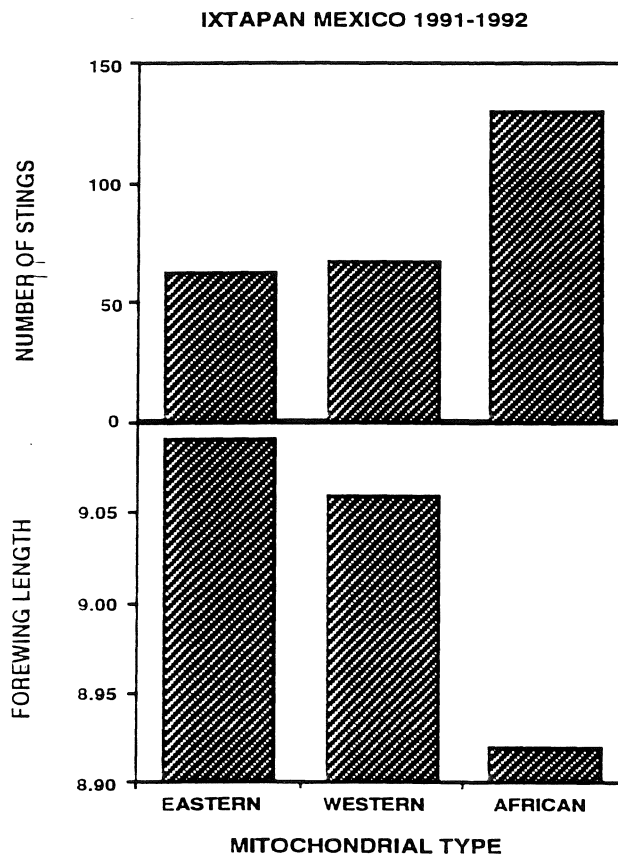


Figure 2. Relationships between mitochondria, forewing length, and stinging behavior in Ixtapan, Mexico.

These results suggest that beekeepers can use forewing length and mitochondria as indicators of Africanization in their bees. In addition, these indicators are correlated with stinging behavior (Fig. 3). Forewing length and mitochondrial assays are much faster and easier to perform than current morphometric identification procedures used to determine Africanized bees.

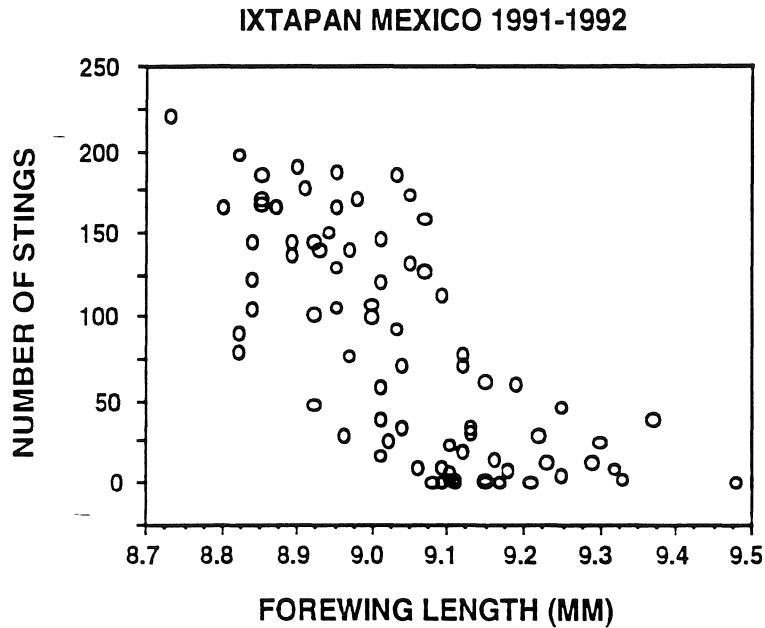


Figure 3. The relationship between forewing length and numbers of stings received in a leather patch in 60 seconds in commercial colonies located in Ixtapan, Mexico. Bees with smaller wing lengths are probably more Africanized than those with larger wings.