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Africanized honey bees in the USA: where do we go from here?

For over thirty years, Africanized honey bees have been expanding their range in the Americas. In 1990, a swarm of Africanized honey bees was found in Hildago, Texas, near the Mexican border. This range expansion has continued and now Africanized honey bees occupy much of south Texas. In 1993 we expect that the expanding populations will reach the states of Louisiana and New Mexico, and perhaps Arizona and California. Just what the geographical distribution of feral Africanized bee populations will be in North America is a matter of conjecture^{3, 12, 15}. Permanent populations will probably become established on the same basis as the Africanized honey bees of Argentina. There, the more temperate south is occupied by primarily European honey bees and the tropical and subtropical north are occupied by Africanized bees similar to those found in much of Brazil. A large area between these two zones is occupied by honey bees showing evidence of extensive European-African hybridization¹¹. This same theme will probably develop in North America, but with modifications caused by the presence of extensive feral and managed populations of European honey bees, substantial differences in ecology between north and central Argentina and southern USA, and differences in beekeeping between Argentina and the USA.

Hybridization will probably play an even larger role in the USA than it has in Argentina. Large European honey bee populations in Mexico have had a 'Europeanizing' impact on some of the expanding Africanized honey bee populations⁸ and highly Africanized colonies still are difficult to find in the Lower Rio Grande Valley of south Texas and even in Mexico'. The continued use of European stock in managed colonies is likely to enhance the hybridization of co-mingled feral populations by providing a gateway for the continued immigration of European genes into the hybridizing populations. Beekeepers in much of Latin America have not had access to European queens for requeening programmes nor have their areas supported extensive feral populations of European honey bees. Hence, the USA is the first place where feral honey bee populations undergoing Africanization will be influenced by the continual immigration of genes from feral and commercial European-derived populations. Hybridization may be expected to reduce the negative effects of Africanized honey bees, a possibility suggested by comparing the approximately 200 human deaths attributed to Africanized bees in their first two years in Venezuela⁴ with not one human death from Africanized honey bees in Texas during a similar period¹⁴.

The ecology of southern USA has great variation: in the next few years Africanized bees will encounter a rich ecosystem diversity. Many of these ecosystems, while they have certain parallels in the tropics, are unique places for Africanized honey bees. All of North America has been inhabited by feral populations of honey bees that, although they are derived primarily from European stock, have undergone centuries of natural selection. Such populations of bees can be expected to interbreed with spreading populations of Africanized honey bees and, with natural selection provided by the unique characteristics of the North American biomes, produce novel populations of honey bees. Such populations may nominally be Africanized, but may differ substantially from the Africanized bees found in the tropics.

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Many aspects of beekeeping are universal and the experiences of other countries provide good examples of what to do and what to avoid. The experience of Mexico with the 'Program for the control of the Africanized honey bee' is especially instructive. One highly successful aspect of that programme concentrated on making information concerning Africanized honey bees and what to do about them readily available to both the public and beekeepers. We can learn from the Mexican success and develop similar programmes in the USA. Other beekeepers, notably those in Brazil, have faced Africanized bees and successfully met their challenges. We can learn from the beekeeping successes of Brazil, where techniques developed to manage more defensive honey bees, and simple culling of queens from the most objectionable colonies have helped in the development of a vigorous national apiculture.

Although there is much to be learned from the experiences of others, some of the apicultural practices of United States beekeepers are unique and will require uniquely North American solutions. Annually, millions of honey bee colonies are moved to provide pollination services or in search of nectar flows in the USA. Some beekeepers move more than 40 000 colonies tens of thousands of kilometres a year. Many of these colonies originate in areas having, or predicted to soon have, Africanized honey bees and are taken to areas thought to be beyond the climatic limits for colonization by perennial colonies of Africanized honey bees. Much of the agriculture of America depends on the continuation of this annual large-scale apicultural migration since it provides an essential pollination service for a wide variety of crops valued at billions of dollars¹⁰.

The United States beekeeping community (beekeepers, state and federal regulators, extension specialists, researchers, and interested administrators) met in St Louis, Missouri, in 1991, to discuss plans to maintain migratory beekeeping and in other ways deal with Africanized honey bees. They discussed the guidelines of the 'National honey bee certification model plan'. This plan, developed by USDA (Animal and Plant Health Inspection Service and Agricultural Research Service) honey bee specialists, was recommended for adoption to state departments of agriculture and contains details of procedures that would permit the interstate movement of honey bee colonies after certification that they are derived from European stock. Field⁷ and laboratory⁹ procedures are recommended to certify breeder queens. These breeder queens are then used to graft queens for production colonies. The production colonies of the year before are used as drone-source colonies and, hence, are also certified. Using these techniques, it will be economically feasible to certify the hundreds of thousands of colonies shipped interstate annually.

Queen breeders who pay close attention to rearing drones and queens^{5,6} should be able to continue to enjoy the climatic advantages of southern areas for breeding honey bees. Drone saturation techniques, isolated mating stations, and instrumental insemination or remote location mating of breeding stock will all be used by queen breeders. These techniques will continue to produce quality stock regardless of the Africanized status of feral honey bees in the beekeeper's area. Stock produced for international sale can be certified according to the field procedures of the model plan or by more stringent laboratory procedures.

Thus, research, planning, and traditional apicultural practices have provided the United States beekeeping community with good tools for managing their special Africanized honey bee problems. The lessons of other beekeeping communities

further add to the resources of United States' beekeeping. However, responses to Africanized honey bees in the USA will be uniquely suited to and expressive of United States' beekeeping and its larger society, and not necessarily always guided by research, planning or the beekeeping experiences of others. Hidalgo, Texas, provides one example of the interaction of United States culture and Africanized honey bees. The city has spent US\$20 000 for a 7 metre-long fibreglass and steel statue of a honey bee. This monument to the arrival of the 'killer bees' has encouraged the arrival of tourists and started an economic revival for the small city. We suspect that the story of Africanized honey bees in North America, rather than coming to an end, is just beginning and will take several more unexpected turns in the next few years.

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