

# 25 YEARS OF THE AFRICANIZED HONEY BEE IN VENEZUELA

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## SUMMARY

A rigorous and exhaustive bibliographical revision was carried out with the aim of elaborating a document that points out the events happened in Venezuela soon after the introduction and establishment of the Africanized honey bee (AHB) colonies coming from Brazil. Written and published documents were consulted from national organisms/organizations as the Ministry of Production and Trade (former Ministry of Agriculture and Husbandry), proceedings from diverse national and international sources (Congresses, Symposia, other), newspaper notes, specialized books, personal interviews with beekeepers and researchers from prestigious universities and the use of the Internet for the revision of the virtual libraries of institutes/institutions that have relations with the AHB issue.

**Key words:** Africanized honey bee, *Apis mellifera*, information, Venezuela.

## INTRODUCTION

Uncertain incidents allowed the liberation of South African honey bee swarms maintained in experimental hives in the quarantine apiary of Piracicaba (Brazil) and with queens, “imported” by Dr. Warwick Kerr and collaborators in 1956, to develop more productive lines of honey bees better adapted to the tropical conditions than the traditionally exploited European bees (*A. m. carnica*, *A. m. caucasica*). The product of natural breeding allowed the development of an hybrid with undesirable characteristic for its managing and exploitation. Southwick (1993) sustained that the breeding (hybridization) of the African honey bee (*A. m. scutellata* Lepeletier) with other races of honey bees, introduced to the Americas by the Europeans, brought up large populations of AHB colonies as a result of its constant expansion. From then on, through an extraordinary genetic dominance and without possible control, the “**africanization**” was originated expanding to the genus *Apis* bee populations of almost all South, Central and (four states of) North America; with the serious consequences on the beekeeping, economy and public health of the countries were these insects settled and especially the consequences on the Venezuelan beekeeping..

## DIPERSION OF THE AHB IN THE AMERICAN CONTINENT AND VENEZUELA

The story of the AHB in the America probably began with Smith's publication (1953) where he alerted that “if the import of exotic bee species was completed in India or the Far East, then the selection of the *adansoni* line (classified *Apis mellifera scutellata*; Ruttner 1986) free from diseases and brought from tropical Africa would be preferable to the same *Apis mellifera*.” The following years, Dr. Warwick E. Kerr received financing and permission to import to Brazil queens of *A. m. scutellata* subspecies; of which some escaped and swarmed (Kerr 1957; Spivak *et al.* 1991). Furthermore, Rinderer (1997) sustained that this unlimited hybridization of the progeny of the African bees in the New World and the fast dissemination and colonization of the AHB in most of South America, all Central America and North America (Mexico) and more recently in the United States of America, is probably the most outstanding ecological event in the century. In three

decades a small experiment with imported honey bee queens constituted to the expansion of millions of colonies that occupy an approximate surface of 25 million square kilometers. The AHB swarms began to invade and settle in the surrounding countries of Brazil (Chile, Argentina, Venezuela and the Guianas). Taylor (1976) sustained that, starting from 1975, two would be the fronts that moved toward Venezuela: the first would be characterized by a low population density; making its entrance in April / 1976 through Santa Elena de Uairen, El Paují and Icabarú (Amazonas State). The other, more densely in population, would move from Guiana (Georgetown and Madhia), forming the northeast arm of invasion; penetrating Venezuela from the Orinoco Delta toward Bolivar State. The importance of this information was that the AHB swarms traveled 320 kilometers in two years, through the Guianas, predicting their entrance from the east (Guiana) and southeast (Brazil). Then, by extrapolation, it was determined that the “africanization” of the native honey bee populations would be, for the eastern part in 1978 and in 1980 for Central-Coastal Region of the country. This issue determined that the pattern of expansion of these hybrids was faster through the tropical dry forest than through the humid forest and that its distribution included regions with annual precipitation between 100 and 6.000 mm. The AHB swarms traveled approximately 250 km / year through the broad Amazon forest causing havocs, desolation and death in many of the domestic animal populations that constituted the basic alimentary sustentation of the residents of the region. Kerr *et al.* (1982), considered that the distribution of the AHB in the southern areas of South America (Argentina) was depending of an isotherm with an average temperature, in the cold months, of 10°C or with a line that indicated 240 days free of ice. On the other hand, Taylor and Spivak (1984) sustained that the isotherm was 16°C of the higher temperature average for the coldest month (July) in Argentina; January in the United States of America.

In 1976 the Venezuelan government contacted Dr. Orley Richard Taylor, Jr., (Department of Entomology, Kansas University) to elaborate a document for the Ministry of Agriculture that contemplated the actions that should be taken to face the advance, penetration and establishment of the AHB swarms coming from Brazil. Dr. Taylor’s document “**Africanized Honey Bees in Venezuela**”, **report prepared for the Ministry of Agriculture and Husbandry**” (Sep. / 1976), pointed out the recommendations and actions that should be carried out to counteract and control the migratory movement of the swarms that, for the moment, were already settled in the Venezuelan territory. Some advices indicated to eliminate colonies and the feral AHB swarms, the detection and elimination of AHB colonies managed by the local beekeepers with the respective compensation, inform to the authorities about the location of swarms “supposedly” Africanized and the instruction and training of the public general and national security. Likewise, he recommended the creation of a Center for Breeding and Production of Queen Bees, using a genetic plan of alternating breeding with European races brought from Austria (*A. m. carnica*), Italy (*A. m. ligustica*), Mexico/E.U.A (“tropicalized” lines) and from previously selected pure (Africanized) local queen stocks. This center was considered to produce 10,000 queens during 1979 and between 40 and 60.000 in 1980. Taylor (1976) estimated a sustentation capacity of about 30.000 beekeepers, managing 1,5 to 2,0 million hives, with average yields of 40 kg/hive. These expectations were considered in such manner that the national beekeeping industry would develop to its fullness and Venezuela could export the honey surpluses generating direct employments and additional revenues to the small producers. Furthermore, he considered the first approach practices to determine the swarm’s “condition” by measuring, the natural honeycombs and using 10 continuous cells that represented 4,5-4,8 cm for Africanized honey bees and 5,5-5,6 cm. for the European breeds.

Figure 1 shows a diagram of the expansion of the AHB swarms from their initial hybridization in Brazil in 1957 to their expansion in the rest of the continent..



FIG 1. Dispersion of the AHB in South America  
 Source: Taylor 1977

Between 1978/79 the Center for Breeding and Production of Queen Bees started its activities in Margarita Island (Nueva Esparta State), selected for its topographical conditions, short and well distributed rain periods, seasonal-tropical climate (two very marked seasons), prevalent wind orientation, daily communication services and transport (terrestrial, air and marine) and considered

isolated from “mainland” for the best control of the bee populations present. The breeding apiaries would be concentrated far from the residential areas and away from the path of tourists.

In 1980 the author was hired as chief of the Beekeeping Program based in Margarita Island to establish what would be the Experimental Apiary for the Breeding and Production of Queen Bee. It was possible to build 100 queen banks for the maintenance and care of fecundated queens and nucs with 312 Italian queens imported from USA, representing the first breeding stocks for the Genetic Program to be implemented and developed. The Program was canceled after one year. A new intention to set in motion the Bee Genetic Program was the establishment of the Honey Bee Queen Breeding Center in Táchira State and the recruiting of a specialist in bee genetics to show the beekeepers the use of instrumental insemination. For multiple technical-financial reasons this Program was not carried out appropriately. The national beekeeping industry continued its slow development, without real direction and without concrete politics for the sector, with honey imports in spite of the high biodiversity of vegetable species blooming almost all year that would support up to 2 million hives (Taylor 1976). The Venezuelan Beekeeping Industry showed a low level of development, high proportion of rustic hives and a low technological level that impeded the development of the beekeeping industry. Later on, the Ministry of Agriculture and Husbandry began with a minor publishing campaign with the edition of several booklets where Gómez (1978) informed on the biology, management and productive and reproductive behavior that characterized this new “line” of bees; although it was evident the massive rejection from the beekeepers to work with these insects and preferred to be dedicated to a less risky activity. Meanwhile, news notes about the africanization phenomenon transcended the frontiers of South America and the alarming, sensationalist international press reports exaggerated about the defensive (aggressive) behavior of these hybrids; characterizing them as **KILLER BEES**. Eischen (1994) assured that AHB swarms had settled in cities, agricultural areas and forests from the north of Argentina to the south of Mexico; and more recently in four states of the USA (California, Texas, New Mexico, Nevada).

## **PAST, PRESENT AND FUTURE OF THE BEEKEEPING INDUSTRY IN VENEZUELA**

O.R. Taylor (1976) estimated in Venezuela 1.5 million hives with an average honey production of 40 kg/hive/year and the opportunity to make even with our neighbor countries to enter the select group of honey exporters. Results of scientific experiments showed that the physical and chemical characteristics of the Venezuelan honey fulfill the standards of quality required by the importer countries; among them, United States of America, Germany and some Caribbean islands. Dr. Taylor made emphasis in the creation of the Queen Breeding and Production Center to replace queens in the Africanized apiaries. These plans were never executed and the Venezuelan Beekeeping Industry continued without a sustainable development, confronting the same initial problems and waiting for the creation of the government politics for a National Beekeeping Plan that confers the sector the relevant position that is given in other South American countries as Brazil, Colombia and Argentina; among others.

Miguel Zamora (1997), as government’s spokesman, informed that there were in Venezuela approximately 45,000 hives with an average honey production of 20 kg/hive/year (2,25% of Taylor’s prediction in 1976). But still beekeeping is set aside as a second production systems among the ones the government gives priority to develop. The few Beekeepers Associations do not participate in the decisions and the politics for the development of the national/regional beekeeping industry. The beekeeping equipment/supplies and components acquired at commercial shops are not of good quality; meanwhile imported equipments are almost impossible to buy by the small producers. The genetic (pool) quality of the Africanized queens purchased is unknown. Few organizations provide credits for the small/medium beekeepers even though this are almost impossible to pay back. Ignorance of the general public about the managing and biology of the AHB and the use of other products (and sub-products) from the beehive as royal jelly, wax, propolis, pollen; among others. Disloyal commercialization of adulterated honey under the denomination of “Pure Honey”; causing damage to the beekeeping industry in general. Few or no

incentives for honey exportation (perhaps due to the international prices; in Venezuela one kilo costs up to 10 US\$. There are no specific treatments and/or preventive/curative health plans to control/eradicate diseases (*varroa*, foulbrood, acarine mites, wax moths, beetles?) that maintain the beekeepers decimated. Honey thieves perform with impunity causing additional losses of materials (hives), colonies (swarms) and work (wages). Not many changes have been performed since 1987 when the newspaper La Nacion published a review of the constraints that kept the Venezuelan Beekeeping Industry way under the expectations suggested by Dr. Taylor in 1976.

The final recommendations/considerations summarized from Zamora's press declarations are the need to add efforts for the development of a sustainable beekeeping industry in the 70% of the Venezuelan territory that Taylor suggested in 1976 could be used for this type of successful enterprise. This can be done with an aggressive campaign for training/capacitating the small/medium beekeepers (and his family) and look for the added value of their beehive products (and sub-products) with the use of family labor. "Soft" credits for the small beekeepers whose farms are located in the surroundings of the commercial cultivated areas like coffee, tomatoes, sesame, critics; within others. Study and decide the best commercialization channels that satisfy the internal (and external) producers/consumers demands. Develop research projects relating to the rational use of the honey bees in the maintenance of the sustainability and biodiversity as the best pollinators for the natural forest and commercial crops. Creation of the Queen Breeding Center for and Health Programs to control/eradicate diseases and develop a more productive and resistant honey bee queens. Projects and programs should have more interest in the social component of the activity and prevail from the political commitment. Create the Consultant Councils to generate the politics for the sector.

## FINAL REMARKS AND CONSIDERATIONS

❖ Ricardo Gomez (1986) published in Venezuela, the first book about the Africanized Honey Bees titled **Apicultura Venezolana. Manejo de la Abeja Africanizada** (Beekeeping in Venezuela. Managing of the AHB), where he gathered all the experience of more than a decade dealing with this new type of bees and enough information about the biology, defensive, swarming/absconding behaviors and other adaptative features that these insects developed and maintained in time by a constant selective pressure of the environmental factors. .... He noted that the Africanized hybrid was characterized by its high sensibility to the disturbance, refined ability to communicate alarm and their astonishing capacity to respond to the external stimuli in a quick and persistent way; behaviors not yet seen from the gentle European honey bees. Their attacks far from being alone, as it is characteristic of the European races, they are massive and indiscriminate.... Other aspects of the Africanized hybrids were based on their foraging strategy that paid more attention to the constant information that is generated in the hive than to other alternatives of energy optimization, ability to gather foods under non favorable conditions and higher frequency of gathering trips per unit of time than the European honey bees.

❖ Dr. David Roubick, in his book **Ecology and Natural History of Tropical Bees**, dedicates a chapter to the Ecology of the AHB in the Tropical America and where, according to Needham *et al.* (1988), the arguments of main interest of the biology of these insects are:

- ✓ Opportunistic selection of the nesting sites, varying from armadillo burrows and hollows in arboreal termite nests, to exposed habitats on tree branches and foliage, bridges, buildings and refuse;
- ✓ Dispersal ability favoring habitat selection (distances of 32 km have been traversed to uninhabited oceanic islands, and longer distances are possible if all honey sources carried from the nest are directed to flight expenditures or if foraging occurs en route);

- ✓ Heightened and persistent defensive capability of nesting colonies and escape behavior of queens following nest disturbance;
- ✓ Facultative swarm amalgamation, including megaswarm formation, allowing queenless and exceedingly small colonies to survive or reproduce;
- ✓ Superior competitive ability allowed by foraging range, orientation, and recruitment abilities far exceeding those of native bees; and
- ✓ Swarm production during at least the major wet-and dry- season flowering periods and production of up to four swarms during each cycle.

❖ Some of the conclusions of the conference submitted by Dr. Thomas Rinderer **African *Apis mellifera* in the Americas: Its Impact on Honeybee Germplasm, Ecosystems, the Beekeeping Community and the Public**, published in the Proceedings of the International Conference: Tropical Bees & The Environment (Malaysia/1995) where he manifested that “the transcendence of the success of the AHB derived from its surprising capacity of adaptation to the unpredictable characteristics of the rainy period of east Africa. This allowed them to prosper, with varied resources, in the different ecosystems of the neotropic. On the contrary, the European bees, although predicting their requirements depending on the photo periods, could never prosper in this environment. The main resulting effect of the africanization, constitutes the change of the genetic structure of the melliferous bee population of the neotropic. The hybridization and selection have generated an hybrid Africanized ”swarm”, which manifest a genetic potential of the parental stocks to produce a series of eco-types of “new” bees of the neotropic.... The ecosystems of the neotropic have demonstrated to be more conservative before the impact of the AHB invading their respective ecosystems. It is probable that the melliferous flora is not yet a competition factor among the native bees, being minimum the impact of the previous invasion. The beekeeping has adapted to these new bees through a difficult transition, which involved the collapse of the beekeeping production followed by a resurgence based in new techniques and new beekeepers.... The general public quickly learned that the bees constituted a danger for the environment and should be treated carefully in order to minimize the accidents for stings.”

❖ Dr. David De Jong (1996), researcher from the Department of Bee Entomology, Sao Paulo University (Brazil), presented a review **Africanized honey bees in Brazil, forty years of adaptation and success**, where he arguments that “beekeeping in Brazil is based on the use of Africanized honey bees. Although at first these bees created severe problems, as the beekeepers had no idea of how to handle them or how to use the appropriate techniques, but now one can do anything with Africanized bees that can be done with European honey bees. Beekeeping became successful again after people accepted the differences and adapted to this new bees. AHBs brought a series of advantages when compared to the European bees. The colonies build up much faster, they are more resistant to diseases, they are better pollinators, they produce more honey and they can also be kept in severe climates where the European bees barely survive; such as the one Brazilian Cerrado, which is something like a dry African savanna. They also produce a lot of propolis, which lately has become an important source of additional income. The diseases resistance is such that it is rare to find someone treating bees with any kind of drug or acaricide. We have European foulbrood, *Acarapis woodi*, *Varroa jacobsoni*, and Nosemiasis, but do not need to treat for any of these. Brazil is one of the few places in the world where it is possible to produce a true organic honey.... Some unknown aspects of the behavior of the AHB are their prolific and ability to select their nesting sites. They can be collected of the eaves and buildings, in old boxes, tires, abandoned furniture and in another infinity of places, capturing the colonies without any cost....”

❖ Bee World published an article by (Dr. Carlos) Echazarreta *et al.* (1997), **Beekeeping in the Yucatan Peninsula : develop of a current status**, where they make review from the Mayan beekeeping to the introduction of the AHBs in Mexico arriving from Central America; where they informed that "the last beekeeping census (1995) showed 726,000 colonies in production with a density of 5,13 hives / km<sup>2</sup> . These are managed by around 18,000 beekeepers (approximately 40 colonies / beekeeper), with an average production of 32 kg honey/hive/year. One of the most excellent qualities of the Yucatan's beekeeping is that it is considered a secondary activity of the small farmers where the additional revenues of their decreased subsistence agriculture (milpa) are not underrated; the milpa provides corn, beans and pumpkins and income for the honey..... Mexico has remained for some decades like one of the biggest producers and exporters of honey in the world. In 1995 it was the fifth producer and third exporter..... The results of the morphology research showed that in 1990 only existed 1% of pure genes in the apiaries. The annual proportion of africanization increased constantly such that in 1974 it was 52%; contrarily the percentage of colonies with pure European morphology descended from 55% in 1990 to 9% in 1994.... The slow dissemination of the AHBs in Yucatan, with regard to South and Central America, was supposedly caused by a combined effect of the high density of European bee colonies and the alert of the beekeepers before the arrival of the Africanized bees to their respective towns. With this substitution rate the colonies would be 100% Africanized by mid 1997... The slow africanization process in the region allowed the beekeepers to gradually adapt changes in the (defensive, swarming, migrating) behavior of colonies and to realize about the new managing conditions that these bees require.... The radical change that the africanization process brought up has been the cause of the collapse of the beekeeping industry."

❖ Dr. Lionel Segui Gonçalves (1998), presented the conference **O Estado Actual e Perspectivas da Apicultura Brasileira**, where he showed the results of his research and concluded that "the Brazilian beekeeping was very questioned mainly in the 60's and 70's caused by the negative impact of the introduction of the African bees *Apis mellifera scutellata* in 1956 (Kerr 1967); that generated many social problems and many beekeepers abandoned their beekeeping activities ignoring by that time its biology and managing, joined to the excessive aggressive behavior when compared to the European bees (Gonçalves 1974 a).... For the high capacity of adaptation of the African bees and Africanized to the Brazilian tropical and sub tropical climate, the reproductive and migratory capacity permitted fast dissemination not only in our territory but in South, Central and North America in only 40 years..... There is a significant number of beekeepers in Brazil at this moment that prefer to work with the Africanized bees because they are more productive, rustic, with higher capacity of adaptation and resistant to diseases..... Two marked stages were considered in the Brazilian beekeeping since the entrance of the African bees *Apis mellifera scutellata* in 1956: the first corresponding to the beekeeping production previous to 1956 and the second, later to 1956, that corresponds to the activity carried out with the Africanized bees..... In regard to the introduction of the *scutellata* bees in Brazil, in the period corresponding to the second stage of the Brazilian beekeeping, an evolution has been registered on the biological, physiological characteristics and behavior of the AHB as an outstanding increase in the national scientific production on *Apis* bees and meliponiculture beekeeping that has lead to a radical change in the methods of managing the bees, an increment in the local production of implements/equipment and the increase on the number of beekeeping associations followed by an increase of the national beekeeping production (honey, wax, propolis, royal jelly). Starting from 1990 the honey production in Brazil reached values of 40 million kg / year (USDA 1990); oscillating in the subsequent years around that figure."

❖ In the XXXVI APIMONDIA Congress (Vancouver/1999), Dr. David De Jong lectured on **Africanized Honey Bees, An Example of Natural Selection and Resistance to *Varroa jacobsoni*** where he manifested that “ in Brazil infestations were initially relatively high, but there was no identification of colony mortality, and within a few years the mite infestations have fallen so low that they were no longer of concern. It has become clear that the varroa in South America does not kill bees in the tropical regions. At first the infestations were considerably higher in the cooler regions of Brazil, than in the tropical parts of the country..... The combination of a large, essentially unmanaged genetic pool, high rates of reproduction, an active bee that is apparently naturally more active and aggressive in combating hive invaders than European bees and a climates that allowed the bees to survive and to coexist with the varroa, despite high initial infestations, all have contributed to a relatively painless adaptation of honey bees in tropical and sub tropical South America to *Varroa jacobsoni*. ”

❖ Dr. Lionel S. Gonçalves, in the XXXVI APIMONDIA Congress (Vancouver/1999) presented the topic **Biological Impact Caused by the Africanization of Honey Bees in Brazil and the Future of the Beekeeping**, where he expressed that “Beekeeping in Brazil was started about 160 years ago with the introduction of the European bees, but this activity did not developed much until 1956. The national honey production in that decade was about 5,000 T/year and beekeeping was considered mainly as a hobby. However, from the time of arrival of the African bees until today, beekeeping has changed considerably in our country. The first ten years of Africanization were very difficult. However, from 1970 on, the beekeeping has steadily progressed. This growth phase in Brazil has been characterized by an effective adaptation and improvement of bee handling methods, an increase in the number of beekeepers and of associations, increased honey production (now about 45,000 MT/year) and other bee products, development of beekeeping equipment, improvement of packing methods, new laboratories for research new technical courses a significant increase in the number of scientific and technical publications on apiculture. In Brazil beekeeping with AHB is now considered a good investment opportunity.”

## CONCLUSIONS

This review summarizes the extraordinary process of Africanization in the Americas and especially in Venezuela, where the AHB has settled for 25 years, pretending for this document to be a guide for the organisms/organizations that have in their hands the possible solutions to initiate once-and-for-all the plan design by Dr. Taylor way back in 1976 and start a new era for the Venezuelan beekeeping industry.

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