Crop Profile for Honey Bees in Texas

Prepared: June, 2003

General Production Information

State Ranking

- Texas National Rank (number colonies) = 7
- Texas National Rank (Honey production) = 7
- Texas Honey value of production = 4.9 million dollars (2001)

Texas Honey bees are managed for honey, pollen, 'packages', queens, wax and contract pollination services. The honey is sold in bulk to wholesalers and retailed to individuals while pollen is provided to the health industry. Queen bees and packages are marketed to commercial beekeepers and to hobbyists. Contract pollinated crops include melons, cucumbers, alfalfa, sunflowers and vegetables grown for seed.

Production Information

Honey bees are generally kept for either recreation or profit. Hobby beekeepers make up the largest percentage of Texas apiculturists and are generally an industry mainstay. There are large commercial beekeeping operations in the State but these are not as numerous as the hobbyist. Commercial beekeeping, however, provides practically all of Texas's beekeeping activities, i.e., contract pollination, honey production and queen rearing. A majority of Texas residential commercial beekeeping enterprises are based in the central, eastern and coastal regions of the State.

Texas provides a good habitat for honey bees. Northern beekeeping operations routinely overwinter in the State because of it's favorable winters and ideal springtime colony expansion conditions. Colonies are brought in, allowed to increase in the spring then divided. Beekeepers will then move back up north with roughly double their original number of colonies.

Most commercial beekeepers in Texas practice some form of migratory beekeeping. By moving bees, operators can take advantage of various seasonal and geographic beekeeping opportunities; generally honey production or pollination services. "Wild flower" honey is 'made' statewide, cotton honey is from West Texas, 'brush honey' is from South Texas and honey from Chinese Tallow is produced along the upper Gulf coast. Most honey "flows" often last only a few weeks and are moisture dependent. Bee pollinated crops are scattered through out the State, however most are in the South and to a lesser extent, the West.
Cultural Practices

Worker Considerations

Beekeepers generally use personal protection equipment to avoid bee stings. A hat, veil, long sleeve shirt and gloves are the standard coverings. This equipment is not good chemical protective gear but does offer some protection from inadvertent exposure to materials that may have been used in a bee hive for pest management. Treatment for parasitic mites is accomplished by placing chemically impregnated plastic strips in hives for a short period of time, usually about 45 days. The amount of time required to treat a bee hive will vary depending on hive size but is accomplished in only a few seconds. Often a beekeeper will prepare hives for treatment by opening them up and then putting on plastic gloves and going from hive to hive inserting the miticide laden strips. Another option would be for a single individual to handle putting strips in hives while another 'opens' and 'closes'.

The Africanized Honey Bee

The insect commonly known as the 'honey bee' is generally believed to have originated in Asia and from there subsequently spread throughout the Eastern Hemisphere. As this movement occurred, groups of the bees became geographically isolated. This isolation lead to adaptations to local conditions and the emergence of races of bees that, while having some physical and habitual differences, remained reproductively compatible. Some of the more common races of honey bees are Italian (Aphis mellifera ligustica), Caucasian (A. mellifera caucasica), Carnolian (A. mellifera canica), the African honey bee (Aphis mellifera scutellata) and the German bee(A. mellifera mellifera). Other genera include the little honey bee, Aphis florea; the giant honey bee Aphis dorsata, and the eastern honey bee Aphis cerana.

The term "Africanized Honey Bee" originates from a hybridization of honey bee races in South America that for potential breeding purposes had been imported from Africa and Europe. Traced to an accidental release of caged African honey bee queens (A. m. scutellata) from a site near San Pauo Brazil in 1956 and subsequent interbreeding with local populations of European honey bees, the Africanized Honey Bee hybrids have since migrated through Mexico to much of the Southwestern United States including California. Known for its often highly defensive nature the Africanized honey bee was first discovered in Texas in 1990 and through 2003 was found in 144 of the state's 254 counties.

The Africanized honey bee is not considered a honey bee pest per se. Aside from a higher degree of management requirements necessitated by its defensive behavior the AHB is often a very productive bee capable of impressive honey yields. Beekeepers who do not want to contend with more defensive bees use management techniques that curtail or severely limit the African gene in their apiaries.

In the late 1980s Texas officials, aware that the Africanized honey bee, or so called "Killer-Bee", was moving northward through Mexico, established a plan to provide the general public some protection
from the expected invasion. A part of this plan was a quarantine program that would limit the movement of honey bees out of Texas Counties where the AHB had been detected. This plan was still in effect in early 2003.

**Pests**

Honey bees in Texas have a number of pests. Two, a parasitic mite (Varroa spp.) and a bacterial disease (American Foulbrood), are the most troublesome and if are not managed will cause major economic loss. Occasional pests such as European Foulbrood, Sac Brood, dysentery and tracheal mites can be harmful at a local level but are not considered major problems statewide, year after year. The Africanized Honey Bee is not presented in this discussion even though in the past 10 years it may have been the one factor that caused some beekeepers to quit the business.

**Bacteria**

- American Foulbrood, *Paenibacillus larvae*
- European Foulbrood, *Melissococcus pluton*

**Fungus**

- Chalkbrood, *Ascosphaera apis*

**Protozoa**

- Nozema, *Nosema apis*

**Amoeba**

- *Malpighamoeba mellificae*

**Parasites**

- Varroa mites, *Varroa spp.*

**Tracheal mites**

- *Acarapis woodi*

**Varroa**
The Varroa parasitic mites were first found associated with Texas honey bees in 1990. In just a few years, around 1993-1995, the parasite was infecting colonies throughout the state and had seriously impacted the Texas apiculture industry. Feral honey bee colonies were affected as well with anecdotal reports indicating a drastic reduction in the occurrence of these 'wild' or feral bee populations.

Varroa parasitic mites attack honey bees by feeding on developing larvae. Adults from parasitized larvae develop poorly with varying degrees of atrophied wings being the typical sign of damage. This poorly developed bee will not be capable of making a significant contribution to its colonies' social structure. As an increased number of bees become deformed because of feeding Varroa, a colony will weaken, gradually decline and ultimately perish.

Systematic investigations on Varroa spp. have revealed a complex of mites represented by at least two genera, *Varroa jacobsoni* and *Varroa destructor*. Within these two species there are a number of strains or subtypes. *Varroa jacobsoni*, believed to have originated in the far east (Malaysia-Indonesia), is now, on a limited scale, distributed world-wide. *Varroa destructor*, distributed world-wide as well, is much more common. Because of the collective genetic diversity of these two mites the development of pest management options can be as diverse and ultimately present many challenges.

Controlling Varroa mites on honey bees is time consuming and expensive. Individual colonies must be examined and treated, often separate from other routine hive manipulations. Both chemical and non-chemical control methods have been developed, however, chemical control is the most consistent method of protecting bees from mite damage. To treat for mites, often in the fall of the year, 1" by 8" chemically impregnated plastic strips are placed inside a colony for approximately 45 days at a rate of 1 strip per five frames of brood. Currently, approved materials are coumaphos and fenvalerate, organophosphate and synthetic pyrethroid compounds respectively. The Varroa mite has shown resistance to both of these chemicals and beekeepers are advised to alternate strip chemistry each year to help alleviate the problem.

Controlling parasitic mites infecting honey bee colonies is difficult because of the mite's habit of infesting sealed brood and the difficulty of penetrating these enclosures. The plastic strips work by slowly releasing the impregnated chemical at a dosage rate that is lethal to mites and not to the bees. Honey bees can complete a life cycle in about 20-21 days. Because the cells are actually only covered for about 11 days, any mite that is in a cell is only afforded protection for this short period of time. With strips being left in a hive for about 40 days, all cells will be exposed.

Other methods of controlling the Varroa mite include some form of device to capture mites temporarily dropping from bees or brood, the chemical formic acid and dusting the bees with powdered sugar. All of these can reduce the number of mites in a colony but the level of control does not approach that of the impregnated strip technology.

A sticky piece of paper placed on a colony's bottom board is commonly used for mite detection. By counting captured mites each day, a fairly accurate assessment of the colonies Varroa mite population
can be made. Other methods of sampling include examining brood in capped cells, "ether rolls" and dusting bees in a colony with powdered sugar.

**Tracheal Mites**

Tracheal mites, *Acarapis woodi*, are internal parasitic pests of the honey bee. These mites inhabit the breathing tubes of young honey bee workers and as their numbers increase can clog these air passages. Heavily infested bees probably do not breath as freely as do uninfected bees and this will subsequently affect functionality.

In Texas the tracheal mite is generally not a serious problem, probably because bees do not spend long periods of time in a tight winter cluster. Damage is limited to an occasional bee yard where infestations will be scattered, often in just a few hives. Some hive treatment may occur but it is not a wide spread practice. The accepted method of treatment for tracheal mites is menthol crystals placed in a hive on the bottom board, preferably when daytime temperatures are above 70 F or higher.

**Hive Invaders**

- Wax moths, *Galleria mellonella*
- Imported Fire Ant, *Solenopsis invicta*
- Small Hive Beetle, *Aethina tumida*

**Wax Moth**

The greater wax moth, *Galleria Melonella* is a pest of bee keeping as an immature. Larvae of this insect feeds on wax and if left uncontrolled can completely destroy all of the comb and wax in a colony. The wax moth, however, is only a pest of empty bee combs and foundation that are stored or on very weak hives, i.e. hives that have very few bees. Strong colonies readily keep wax moth larvae below damaging levels by actively searching out and destroying the intruders. Wax moth larvae are generally present in the warmer months and their management is an important off-season task of beekeepers.

Wax moth control is usually accomplished by fumigating bee equipment. Before winter storage small operators stack suppers and tape the joints to form an air tight seal. Before sealing, paradichlorobenzene (PDB) crystals are placed on sheets paper sandwiched withing the stacked suppers. Fumigation on a large scale is with aluminum phosphide in gas-tight rooms.

Non chemical approaches to wax moth control include stacking suppers in a cris-cross pattern under a open air shed, cold treatments(10 F/3 hrs or 120 F/40 min) and modified atmospheres with CO2 . Suppers can be stacked above an inner cover on a active hive and the resident bees will keep the equipment clean.

**Fire Ants**
The pest status of fire ants in apiculture is often debated. As potential pest, ants will feed in honey bee boxes and under certain conditions destroy colonies. There are situations however, where fire ants and honey bees live in apparent harmony, coexisting in a symbiotic-like relationship. The ant nest will develop in the soil under a colony or pallet of bees, often mounding up the side of brood chambers, but will not actively feed within the colony. As long as the hive is strong, with a large number of workers, the fire ants are often not a problem. Should a colony decline for whatever reason, queenless or weak queen, fire ants will invade and devour any available bees, brood and eggs. There is however, some advantage for the beekeeper since the inevitable wax moth invasion may be delayed for a few weeks.

Fire ants are often a greater problem for the beekeepers. Any necessary hive manipulation that requires the beekeeper standing near a hive is subject to a fire ant stinging incidence if the ant colony is under or close to the bee box.

Bee colonies that are moved for pollination services into an area that is fire ant free are subject to quarantine restrictions. This is the case for bees moving from known fire ant infested states like Texas into California Almonds. There are very strict rules governing the movement of bees into or through "fire ant free" states. Inspectors halt and will subsequently turn back any shipment of bees that is found to have fire ants, even single fire ant individuals.

**Small Hive Beetle**

The small hive beetle was first discovered in Florida in June of 1998. Since that time it has been identified in a number of other states, mostly in the south east. There has been no official recording of a small hive beetle breeding population in Texas to date, although beekeepers believe that it will eventually make it to the state.

The small hive beetle is in the beetle family, Nitidulidae. It is a known pest of beehives in South Africa and is suspected of being able to survive on a number of different kinds of fruit. In a beehive, female small hive beetles randomly lay eggs which hatch into larvae that feed on honey, wax and immature bees. Pupation occurs under a hive in the soil. Discarded wax, 'slum gum' and old poorly cleaned honey processing houses are ideal small hive beetle refuges. Detection is accomplished by examining hives for the presence of larvae and by traps designed to capture adults.

**Pest Management in Texas Honey Bees**

<table>
<thead>
<tr>
<th>Application</th>
<th>Colonies Treated</th>
<th>Rate</th>
<th>Treatment Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coumaphos (Check-Mite)</td>
<td>80,000</td>
<td>1 strip/five frames brood</td>
<td>45 days</td>
</tr>
<tr>
<td>fluvalinate (Apistan)</td>
<td>20,000</td>
<td>1 strip/five frames brood</td>
<td>45 days</td>
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</table>
Texas honey bees are plagued by a number of diseases. Those known to occur are foulbrood, sac brood and protozoan diseases. Each has the potential of being a serious hive pest but American foulbrood is generally considered the most common and most devastating.

**American Foulbrood**

American foulbrood is caused by the bacterium, *Bacillus larvae* White. This disease of developing honey bees is generally detected in the spring during active brood rearing but can occur anytime maturing larvae are present. Transmission is by the bacterium's spore stage which is ingested by the feeding immature bees. Another factor that contributes to this disease's severity is the ability of the spore stage to survive almost indefinitely, particularly on contaminated bee keeping equipment.

Any movement of bees or equipment can transmit American Foulbrood. Drifting bees, robbing and the manipulation of equipment in association with normal beekeeping practices are considered the most common. Larvae infested with this form of foulbrood usually die in the upright position and if a cell is sealed the cap will often be 'sunken'. A common method of detecting American foulbrood is to insert a small stick into a suspected cell and if a "ropy goo" is noticed when the stick is withdrawn, then the disease is suspected. Using a combination of sunken cells, a positive "ropy" test, dark brown larvae, dried larval scales in cells with protruding pupal tongue and many open cells scattered through a brood pattern, American foulbrood is suspected.

The current method of dealing with American foulbrood is a combination of sanitation and preventive antibiotic treatments. By keeping equipment as disease free as possible, which could include burning disease laden equipment and applying antibiotic laced powdered sugar and/or granulated sugar/shortening patties prior to the heavy brood rearing season, Texas beekeepers generally manage the American Foulbrood. However, there have been reports of suspected resistance to the antibiotic TERRAMYCIN which has lead to an increased concern in the beekeeping community over the possible inability to successfully deal with this disease.

**European Foulbrood**

While European Foulbrood (EF) is a recognized disease of honey bees, it is generally not considered to be a major problem within the industry. Actually, it is not as well understood as American foulbrood
which may contribute to its relegation to a less significant pest position in apiculture. A pest that attacks the honey bee larvae, EF manifests itself by killing immatures often before cells are sealed. The resulting scale is much more elastic or rubbery than those caused by American Foulbrood and dead larvae do not exhibit a 'ropy' characteristic.

Prevention is the most important approach to European Foulbrood management. Infected colonies should be isolated to prevent drifting of individuals to uninfected colonies and if there is a severe infestation to burn the colony or at least the diseased laden frames. Bees in the area should be treated prior to a brood rearing period with oxytetracycline hydrochloride (Terramycin-TM). The use of an antibiotic helps prevent spore development in larvae's gut.

In recent years beekeepers have been increasingly concerned about possible foulbrood resistance to currently used antibiotics. Resistance has been documented in other states and could be occurring in Texas.

**Chalkbrood**

Chalkbrood is a disease of honey bee larvae that is caused by the fungi *Ascosphaera aphs*. An infestation is characterized by dead larvae that have a chalky appearance. This is not considered a serious disease in Texas but it does occur from time to time in most bee yards, but seldom reaches epidemic proportions. Mycelia of this Ascomycetes grow in the hind gut of bee larvae and eventually will consume it's entire body. Chalkbrood infested bees (mummies) will be either white or gray to black. Field detection of chalkbrood is fairly straightforward, noted by pin holes in capped cells along with chalky appearing bee mummies in cells and on the hive's bottom board. Absolute identification is only possible using laboratory techniques.

**Nozema**

Nozema is a disease of adult honey bees caused by the single-celled protozoan, *Nozema apis*. Nozema disease generally occurs in the spring during cooler wet weather and at other times of the year when similar conditions prevail. When cool/wet weather is coupled with stressful conditions honey bees become more susceptible to the disease. This makes Nozema a particular concern for spring time package and queen rearing operations especially following a long confining winter.

Like many other bee diseases Nozema is best prevented with sanitation. Attention should be paid to keeping overwintering hives properly ventilated and the bottom boards dry. A good strong queen is important as are adequate stores. Preventative treatments include the feeding of the antibiotic Fumagillin in sugar syrup, usually in the fall and in spring during package bee and queen rearing season.

**References**
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References


**Web Sites**


