UNIVERSITY OF FLORIDA
IFAS EXTENSION

CIR766

Diseases and Pests of the Honey Bee[1]

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Like all living organisms, honey bees are can be infested with diseases and pests. Some of these are more deleterious to bee colonies than others, but it is important for the beekeeper to be able to recognize conditions which might be disease or pest related and respond accordingly. The purpose of this publication is to describe possible diseases and pests of honey bees.

The honey bee is a colonial insect. As such it is often necessary to look at the colony as a whole to determine damage by disease or pests. However, the beekeeper must be careful not to assume all conditions leading to population decline or reduced honey production are the result of disease. Colonies can be slightly damaged by pesticides, for example, and/or nutritional deficiencies. It is important, therefore, for the beekeeper to be as informed and obtain as much assistance as possible in diagnosing bee disease or pest problems.

Often the best place to get help on diseases and pests of bees in most states is through the bee inspection service, usually administered by the state department of agriculture. In Florida this is the Divison of Plant Industry of the Department of Agriculture and Consumer Services, P.O. Box 1269, Gainesville, FL 32602. Florida state law regulates beekeeping as it does many other agricultural activities.

Bees have two distinct life forms (brood and adult) and most diseases are specific to either one stage or the other. The most virulent diseases at present are those of the brood, specifically American foulbrood and European foulbrood. Other brood diseases include chalkbrood, a fungal disease which appears to be on the rise and sacbrood, caused by a virus. In the southeastern United States, especially Florida, Georgia, Alabama, a deleterious condition called "purple brood," is sometimes correlated with areas where large stands of summer ti ti (*Cyrilla racemiflora* L.) are present.

The adult stage of the honey bee is also affected by diseases, but both symptoms and damage done to colonies are often less well defined than those resulting from brood diseases. This does not mean, however, they can be ignored. The most damaging adult disease appears to be nosema, caused by a microsporidian that infects the digestive system. The incidence of nosema very often is correlated with stress on a colony. Several viruses also affect both adult worker and queen honey bees, and certain

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worm-like parasites called spiroplasmas found in nectar have been shown to be deleterious to workers.

Parasites have also been identified in bee colonies. One, called the bee louse, is really the wingless fly, *Braula coeca*. It has recently been seen for the first time in Florida, but has been associated with colonies along the eastern shore (Maryland) for some time. It remains only a biological curiosity, at present in the United States, although certain parts of Europe (i.e. Spain) have reported large infestations. The recent introduction of the parasitic honey bee tracheal mite to Florida has added another pest about which little is known and for which no EPA-approved control measures are yet available.

Predators of bee colonies may include certain wasps (yellowjackets), ants, wax moths, the black bear and last, but not least, man. Most of these are prevalent year-round in Florida with its mild subtropical climate and large tracts of uncultivated land.

The bee disease/pest picture is presently clouded with many often conflicting ideas on control. This stems from beekeepers' and others' insistence that simple answers will address problems encountered when culturing one of the world's most complex insects. Reasons for decline in colony populations are numerous and might even be a combination of things including: pesticide poisoning, nurtional imbalance, genetic susceptibiblity, as well as diseases, pests and/or predators. In the past, names given to describe colony conditions such as "autumn collapse," "spring dwindling," and "disappearing disease," have not been helpful in determining solutions to perceived problems.

Often neglected by beekeepers and researchers alike in the search for solutions to diseases and/or predators is use of genetic selection for resistant stock. Some lines of bees are inherently more healthy and productive in specific geographic areas than others. The main reason one the almost universal recommendation for any problems, requeening, has a good chance of success is due to the great variability that exists in honey bees in the United States. Genetic engineering of honey bees is only in its infancy; few programs can boast any real homogeneity in their stock. Because of this, each beekeeper must necessarily become a "breeder of bees," by continually judging by trial and error how certain bees fit his or her operation.

It is also a myth that better stock exists elsewhere. This has and continues to result in the practice of introducing bee stocks from one area of the world to another. Introduction of Africanized honey bees and the Asiatic bee mite, *Varroa jacobsoni*, to South America and now the tracheal mite, *Acarapis woodi* R., to Central America and the United States shows how dangerous this can be. The United States has a law against importation of semen, eggs, brood or adult bees, and it is becoming more and more clear that the practice of importing bee stock must be stopped and genetic selection of stocks in specific geographic areas be substituted, if progress against bee disease is to result.

BROOD DISEASES

American foulbrood

American foulbrood or AFB is by far the most virulent brood disease known in honey bees. The reason for this is the causative organism forms heat- and drought-resistant spores, capable of germinating in a favorable environment at any time. High incidences of this disease in the past have led to the bee inspection programs now present in most of the United States.

The disease is caused by the spore-forming bacterium, *Bacillus larvae*. It attacks older larvae and young pupae, which are literally digested by enzymes secreted by the bacterium. Infected individuals turn brown, then black, the resultant mass becoming a hard "scale" of material deposited on the side of the cell (Figure 1).

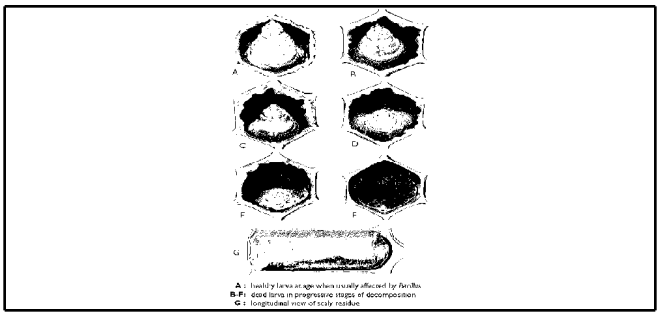


Figure 1.

The symptoms of American foulbrood include:

1. A characteristic odor, sometimes described as sour or "of a glue pot."
2. Perforated or sunken cappings, darker in color than healthy brood cappings.
3. Resultant black scales, difficult to remove from the cell because of their stickiness. The scales may exhibit adult characteristics like legs, heads or tongues, which are clearly diagnostical for this particular disease.

Diagnosis of American foulbrood requires experience, often only available from a trained bee inspector. The "ropy" test can be used to make a preliminary diagnosis. A stick or twig is inserted into the cell and then withdrawn; the affected larvae "sticks" tenaciously and the contents can be drawn out into a long string or "rope." The Holst Milk Test another possible test. An affected individual or scale is swirled in a weak solution (1%) of skim milk. If the milk clears, American foulbrood is suspected. Finally, a brood sample may be sent for microscopic diagnosis to:

Beneficial Insects Laboratory

USDA/ARS

Beltsville, Maryland 20105

Transmission of American foulbrood is possible in a number of ways, including feeding infected honey and pollen, using contaminated equipment, and installing infected package bees or queens. Because honey from unknown sources is always suspect, use of sugar syrup to feed bees is preferrable in almost all circumstances. It is recommended that hands and hive tools be kept as clean as possible at all times to avoid possible contamination among colonies.

Because the spores can remain viable (capable of germination) for so long, most states require bee colonies with American foulbrood to be burned upon discovery. Some, like Florida and Georgia, pay a small indemnity, others do not.

Prevention of American foulbrood is accomplished by good management procedures (this may include eliminating colonies that are suspected of having the disease and/or feeding an antibiotic). The only antibiotic legal to use at present is oxytetracycline. Terramycin, a registered trademark of Pfizer, Inc., is generally available at bee supply houses.

A great deal of controversy exists concerning feeding antibiotics to honey bee colonies for prevention of American foulbrood. Most large-scale beekeekpers find it more efficient to routinely treat their bees. On the other hand, many small-scale operators do not follow such a feeding program, preferring instead to let symtoms appear and then have the bee inspector diagnose and then burn the colonies and collect the small indemnity fee (not available in all states). This removes disease reservoirs and eliminates susceptible stock, not possible where preventative feeding with antibiotics effectively may mask all symptoms. Generally speaking, once a decision has been made to feed antibiotics, such a prevention program must become a permanent part of the operation's activities. Finally, if antibiotics are not fed, this eliminates any risk that they will contaminate a honey crop.

There is a general lack of agreement among researchers, regulators and others concerning effectiveness of preventative feeding as a desirable disease control policy. Consequently recommendations may vary widely. For a more detailed discussion on the matter, consult appropriate sections in:

- *Honey Bee Pests, Predators, and Diseases,* edited by Dr. R.A. Morse, Comstock Publishers, Cornell University Press, 1978
- *Honey Bee Pathology*, by Leslie Bailey, Academic Press, 1981, and/or
- *The Hive and Honey Bee*, Dadant and Sons, Inc., Hamilton, IL 1975 (see references).

Most authorities agree that the approved dosage of oxytetracycline hydrochloride is 200 milligrams per one ounce feeding. Several formulations are presently available and are named based on the

amount of active ingredient (i.e. TM-10 = 10 grams active ingredient per pound). TM-25, simply called Terramycin Soluble Powder (TSP), can be fed in syrup. The other formulation (TM-10) is not soluble in water and must be fed as a dust. At least one formulation of oxytetracycline already mixed with a carrier can be purchased from bee supply outlets.

The general rule to follow is feed according to the instructions on the label. The label is the law and must be followed to the letter. Unfortunately, the label is often missing from small portions of the product and confusion may result. According to the latest information on the Pfizer label for (OXYTETRACYCLINE HCL) Terramycin Soluble Powder #60-7000-00-1: Use 1 level teaspoonful Terramycin Soluble Powder (TSP) per ounce of powdered sugar per colony as a dust or 1 level teaspoonful per 5 lb jar containing 1:1 sugar syrup per colony. In addition, when making syrup it is advisable to first dissolve the TSP in a small amount of water to facilitate mixing. Because TSP is soluble, some have experienced trouble using it as a dust formulation in humid environments.

With reference to dusting, the label says to mix 1 lb TM-10 (a different product from TSP) with two pounds of powdered sugar, then apply one ounce of this mixture per feeding. Applying the dust on the outer parts or ends of the frames and feeding the syrup in pails is suggested. Usually three feedings or applications (either syrup or dust) at 4-5 day intervals are required in the spring and/or fall at least 4 weeks before the main honey flow to prevent contamination of marketable honey.

Remember: Laws governing agricultural chemicals are continually in flux and new products are periodically available which can make previous labels and/or recommendations obsolete. It cannot be overemphasized that only instructions as they appear on the label should be followed when using any chemical product either in disease and/or pest and predator control.

European Foulbrood

European foulbrood or EFB is closely related to American foulbrood in symptomology. However, the caustive organism, the bacterium, *Streptococcus pluton*, does not form spores, and so the disease is considered less problematic than American foulbrood. The bacterium generally only attacks younger larvae. As a consequence, perforated cappings may be absent and the affected individual may still be in a coiled state, resulting in a "twisted" scale. As with American foulbrood, the EFB-infected individual is reduced over time to a dark scale (Figure 2).

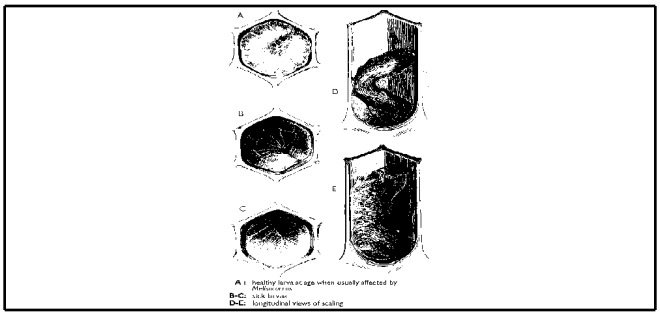


Figure 2.

The symptoms of European foulbrood include:

- A characteristic odor.
- Perforated or sunken cappings, rarely present.
- A resultant black scale, often twisted or contorted in its cell and easier to remove than American foulbrood scales.

Diagnosis of European foulbrood is almost the same as that for American foulbrood. The ropy test shows less stringyness or ropyness (subjective at best and not considered definitive diagnosis), and the Holst Milk Test does not result in a clearing of the solution. Again, the bee inspector's on-site diagnois is recommended, and samples may be sent to the Beneficial Insects Laboratory.

Transmission of European foulbrood is the same as for American foulbrood. Again, it is recommended hands and hive tools be kept clean of debris (wax, propolis) when working a number of colonies.

Treatment of European foulbrood is generally less drastic than for American foulbrood. Only in very severe cases is burning resorted to. Generally,

requeening with more resistant stock will clear up the disease. This provides a break in the brood cycle and introduces new genetic (possibly more resistant) material into the colony. In addition, routine prophylactic with the antibiotic oxytetracycline (Terramycin) is effective for prevention of European as American foulbrood (see section above on feeding antibiotics).

The amount of stress a colony is under can often be correlated with development of European foulbrood. Symptoms may appear when a large amount of brood is being reared or during nectar dearth. The role played by good management technique, therefore, which reduces stress on a colony cannot be overemphasized in controlling European foulbrood, as well as most other diseases in bees.

Chalkbrood

Chalkbrood is a fungal disease. Although considered by many to be a relatively minor disease of honey bees, it appears to be on the rise in much of the United States, and some geographic areas in Florida have reported large infestations. The disease is characterized by infected brood, called "mummies," which when removed from the comb, appear to be solid clumps, reminiscent of chalk pieces. The mummies can vary in color from white to dark gray or black (when fruiting bodies are present).

It has been suggested importation of pollen from abroad is correlated with the increase in incidence of chalkbrood, a fungal disease. Growth of the caustive organism, *Ascosphaera apis*, appears to be enhanced by a number of factors, including high moisture content (colonies not well ventilated in high humidity situations), cool temperatures and colony stress.

There is no recommended chemical control for chalkbrood; often requeening a colony will be effective treatment. Good hygienic behavior by a colony, that is quick removal of the mummies by workers, appears to aid in clearing up the symptoms. Although it remains somewhat of an enigma, some generalizations appear to be in order concerning chalkbrood according to most authorities:

- It occurs mostly in colonies expanding during the summer.
- It rarely kills a colony, but will weaken it, leading to a reduction in honey surplus.
- It is promoted by certain conditions, dampness, susceptibility of bee stock, inadequate nutrition, other diseases or conditions (queenlessness, laying workers, chilled brood).
- It is spread mainly by beekeepers.
- It appears that requeening with resistant bee stock is the most likely way to clear up the symptoms.

For a fuller discussion of the disease, refer to appropriate sections in the works referenced above. L.A.F. Heath has also published more recent reviews. See: "Development of Chalk Brood in a Honey Bee Colony: A Review," *Bee World*, Vol. 63, No. 3, 1982, pp. 119-130 and "Chalk Brood Pathogens: A Review," Same volume, pp. 130-135.

Stonebrood

Besides chalkbrood, another disease called stonebrood has also been identified. This disease is presently of minor importance, but should not be totally ignored by bee inspectors and beekeepers. The causitive organism may be one of several species of *Aspergillis*. As with chalkbrood, no control has been developed.

Sacbrood

Sacbrood is a viral disease of the brood and considered of only minor importance. Affected larvae appear to the observer when removed from the cell to be a water-filled sack, hence the disease's name. There is no recommended control for sacbrood.

Purple Brood

"Purple brood," is not a disease as such, rather it is more a condition associated with areas abounding with summer ti ti (*Cyrilla racemiflora* L.). Either the nectar and/or pollen of this plant is responsible for killing the brood and turning it a deep purple. Larvae, pupae and even newly emerged bees may be affected. Fortunately this condition is not widespread and occurs only in selected areas of the southern United States. Perhaps the largest outbreaks were reported in the 1930s, when fifty percent of some apiaries were affected in Madison, Taylor and Jefferson counties in Florida.

Given purple brood's association with the summer ti ti plant, it is advisable for beekeepers to avoid areas where large expanses of the plant are blooming (usually May and June). In addition, it is possible to feed bees sugar syrup which dilutes the effects of summer ti ti on bee colonies. Usually, areas where the condition is likely to occur are well known; talking with long-time beekeepers or contacting a local beekeeping association often will alert the novice about historical incidences of purple brood in a region. For further information, consult Florida Cooperative Extension Circular 686 , "Florida Bee Botany."

ADULT BEE DISEASES

Nosema

By far the most damaging adult disease of honey bees is nosema, caused by a spore-forming microsporidian, Nosema apis, that infects hind gut (ventriculus) of the digestive tract (see Figure 3). It is worldwide in distribution and always present in colonies, but at varying levels. High incidences of nosema are directly related to stress such as periods of long confinement, rapid brood buildup, nutritional imbalance and inclement weather.

Symptoms of the disease are not clear cut and sometimes, even at high levels of infestation, are difficult to detect. They can include: unhooked wings, distended abdomens, and what has been characterized as stupified, disoriented or paralyzed behavior. Nosema leads to reduction in a honey crop as well as accelerating queen supersedure.

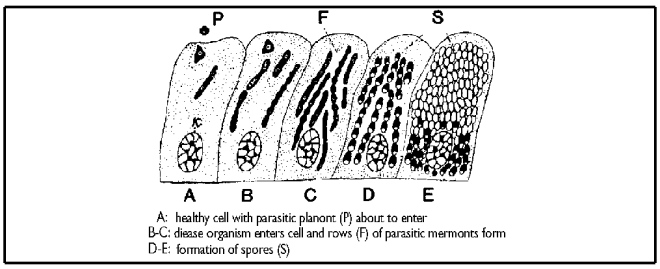


Figure 3.

Diagnosis of the disease may be possible in the field by removing a worker's head and examining the digestive tract. If it is straw brown in color, this is considered normal; if, however, a white and distended hind gut (ventriculus) is observed, this is often correlated with a very high infection of nosema. In the laboratory, nosema can be discovered by crushing the ventriculus of several bees, counting the spores and calculating the resultant number per bee; diagnosis is also possible by sending a sample of worker bees to the Beneficial Insects Laboratory. Controlling nosema disease can be accomplished by one or a combination of practicing good management technique and feeding the antibiotic fumagillin, marketed under the trade names of Fumidil B and/or Nosem-X.

Suggested feeding recommendations for fumagillin for nosema control are as noted on the label of the product; feeding is generally preferrable in the fall of the year. Fumagillin is active only in syrup; dusting is not recommended. Because nosema is more virulent in confined bee populations, it generally is considered much more of a problem in temperate areas. Recommendations by the Minnesota State Inspection Service in 1980 as published in the *Minnesota Beekeepers Magazine*, Vol. 34, No. 3 suggest the following feeding schedule.

1. Feed every two or three years if a colony averages 0.11 to 1.0 million spores per bee; this level may result in decreased honey production.

2. Feed once every two or three years if a colony averages 1.1 to 5.0 million spores per bee; this level may result in reduced honey yield and increased spring and winter loss as well as queen supersedure.

3. Feed two years in succession if a colony averages 5.1 to 10.0 million spores per bee.

4. Feed every year if a colony averages in excess of 10.0 million spores per bee.

Florida research over the years indicates a general infestation of 2 million spores per bee with maximum seen of 36 million per bee. Feeding fumagillin at even this level can result in substantial increases in honey production (See references).

Nosema infected equipment can be decontaminated by use of heat (120°F for 24 hours). The temperature must not exceed this or the combs might melt. The technique must be used on empty comb only. Fumigation with acetic acid and ethylene oxide have also been reported. For a fuller discussion of nosema etiology and treatment, consult the works referenced above or at the end of this publication.

Viruses

Adult honey bees may fall prey to many kinds of viruses, which because they are not easily detected, are often ignored by bee inspectors and beekeepers alike. Perhaps most recognized is chronic bee paralysis. Some bee stock is highly susceptable to this virus which causes the workers to become hairless and develop a uniform black color. Other viruses found to affect honey bees include "Arkansas bee virus," "S-shaped virus," and "slow bee paralysis virus."

Other Adult Diseases

Miscellaneous minor diseases of the adult honey bee appear to abound. A rickettsial disease has been identified and so has amoeba disease. Perhaps the newest class of diseases is that of spiroplasmas, small worm-like creatures present on flower surfaces. One species has been implicated in "May disease" in France, a formerly misunderstood spring die off of honey bees.

PESTS AND PREDATORS

The honey bee colony is not immune from predation and it can take a variety of forms, from destruction of a comb by wax moth to physical dismembering of a colony by a hungry black bear. The most damaging group of pests are arthropods, relatives of the bees themselves.

Wax moth

Traditionally, damage by wax moths (generally the greater wax moth, *Galleria mellonela*) has accounted for large losses of stored comb. This is especially in the southeastern and southwestern United States, where warm temperatures ensure a viable wax moth population year around. The larval stage of the wax moth does damage by boring into and leaving silk-lined tunnels or galleries in the combs, in extreme cases, the comb is reduced to nothing more than a mass of web. Larvae will also bore holes in the wooden parts of the hive. Figure 4 shows both adult and larval stages.

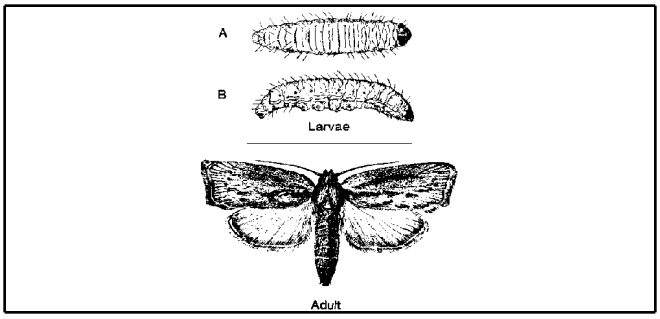


Figure 4.

It is emphasized that the wax moth is generally not responsible for the death of a colony. Rather this insect is a "garbage man" of sorts, moves into areas unprotected by worker bees, and can be an early warning signal that everything is not well with a colony. Strongly populated honey bee colonies always have wax moths, but are unaffected because the moth larvae are being continually sought out and then cast out of the hive. Only when a colony becomes weak in numbers because of disease, starvation or some other occurrence, does the wax moth move in to "clean up" the colony by consuming the comb.

Wax moth is a consistent and vexing problem in stored comb; the rate of of moth development in a stack of stored supers rivals the imagination! Traditionally, stored comb has been either heated, cooled or fumigated with chemicals to deter wax moth infestation.

A bacterial disease spore, which attacks only wax moth larvae, is now marketed under the name Certan for control. This material represents a breakthrough because the disease is so specific it cannot harm either bees or people and can be used with little concern around bees or equipment. However, its application is labor intensive and not favored by large-scale operators. Several chemical fumigants that have been used in the past were methyl bromide, aluminum phosphide, ethylene dibromide (EDB) and paradichlorobenzene (PDB). At present, only aluminum phosphide and PDB are approved in Florida.

Of these, paradichlorobenzene is less dangerous to the applicator and easier to apply. Unfortunately, it does not kill all stages of wax moth and so remains more of a preventative; it will not clean up a severe case.

Again, it is advisable to buy any chemicals for beekeeping use from bee supply houses; this way full information on use of the substance in beekeeping is available. All pesticides must be labelled for use on stored comb; **the label is the law**, under no circumstances should a pesticide be used, if that use is not **specified** on the label. Beeswax is similar in structure to many insecticides and often has an affinity for these substances. As a consequence **extreme caution** should be excercised when using pesticides anywhere near a beekeeping operation. For further information on toxicity of pesticides, see Florida Cooperative Extension Circular 534 , Protecting Honey Bees From Pesticides.Table 1 is a chart of temperatures required to kill all stages of wax moth using cold or heat treatment as published in *Farmers' Bulletin* Number 2217 "Controlling the Greater Wax Moth..A Pest of Honeycombs," USDA Science and Education Administration, 1981.

Care should be taken when treating with cold because beeswax becomes brittle and breaks easily. Even more caution, however, is advised when heat-treating combs. They should only have very little honey to avoid distorting the wax comb, must be placed vertically in supers and the heat must be circulated to avoid creating hot spots which could melt the comb. Consult referenced works for more information on wax moth control.

Other Arthropods

Several other insects also attack honey bee colonies, including several species of ants, robber flies, mantids, yellowjackets and other wasps. In Florida, a species of beetle that eats stored pollen has been reported. In addition, exotic bee mites, introduced into South and Central America from Asia and Europe, consistitute permanent threats to beekeeping in North America.

Strong populous colonies of honey bees are the best defense against ants or yellowjackets, although in isolated incidences certain species of carpenter ants and/or yellowjackets may over run a colony. The only recommended control is to seek out the nests of these invaders and deal with them at the source.

The pollen-eating beetle, *Euphora sepulchralis*, can be found not only in beehives on occasion, but also feeding on the tassels and silks of corn and rose blooms. It is metallic green, about one-half inch long and looks very much like a Japanese beetle. Euphora can do a good deal of mechanical damage inside a beehive as it bores through comb in search of stored pollen. The bees cannot remove nor kill the heavily-armored beetle. Fortunately, invasions are rare and populations often don't get large, so damage in general is minimal. Little is known about the beetle and no control measures are known to be adequate.

Although several species of mites exist on honey bees in the United States, only one has been implicated as damaging. The effects of the honey bee tracheal mite (*Acarapis woodi*, Rennie), which develops inside the tracheal breathing apparatus of the honey bee are currently being studied. The mite was recently (1984) found for the first time in the United States; Florida to date appears to have the largest mite population and has officially been declared infested, although many colonies certify for movement out of state.

Unfortunately, little is known about the mite and its potential deleterious effect on bee colonies in the United States. Controversy continues on the subject, the latest findings have been reported in the "Proceedings of the Honey Bee Tracheal Mite (*Acarapis woodi*, R.) Scientific Symposium", July 8-9, 1986, St. Paul Minnesota, published by the American and Canadian Associations of Professional Apiculturists.

The mite apparently has been effectively dealt with in Europe for many years, but controversy exists there concerning its impact on colonies. For further information, see:

- "The 'Isle of Wight Disease': The Origin and Significance of the Myth," by L. Bailey, *Bee World*, Vol. 45, pp. 32-3, 1964 and
- "Isle of Wight' or Acarine Disease: Its Historical and Practical Aspects," by Brother Adam, *Bee World*, Vol. 49 pp. 6-19, 1968.

The mite is extremely difficult to detect; the large breathing trunks behind the head must be removed and examined microscopically (Figure 5).

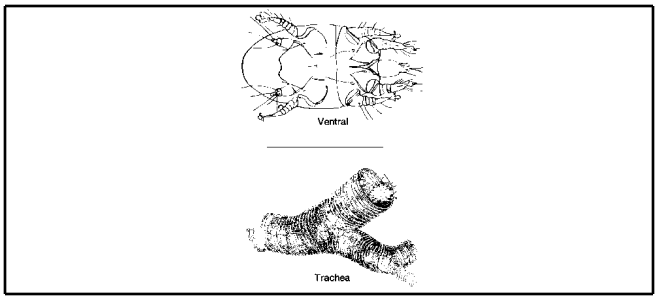


Figure 5.

Relatively new to the beekeeping industry is the Asiatic bee mite, *Varroa jacobsoni*. It was unknown to beekeepers in the western world until the 1950s, when it was introduced into European U.S.S.R. from Asia. The mite is resident on the eastern honey bee, *Apis indica* (cerana), where it causes little damage. The European honey bee, however, appears to have little resistance to the mite's depredations and literally tens of thousands of colonies in temperate Europe have died since its accidental introduction. All stages of the mite feed on both larval and adult honey bees. The mites prefer drone brood and can be detected by uncapping drone larvae or pupae; the dark colored mites show up well in contrast to the white brood. Alternatively, white paper can be placed on the bottom board of a colony and the detritus examined from time to time for mites. The mite is not yet present in the United States nor Canada. It is reported in conjunction with wild Africanized honey bees in South America. A full bibliography has recently been published on Varroa, but is not readily available (see references).

The Varroa mite at present may be confused with another arthropod, the bee louse, present on some bees in the United States. The louse (*Braula coeca*), however, is a wingless fly, has only six legs and a much different body shape than Varroa (Figure 6). The louse is present in Maryland and recently was discovered in Florida. It usually is considered nothing more than a biological curiosity in the the United States, but has been reported to cause substantial damage in certain parts of Europe.

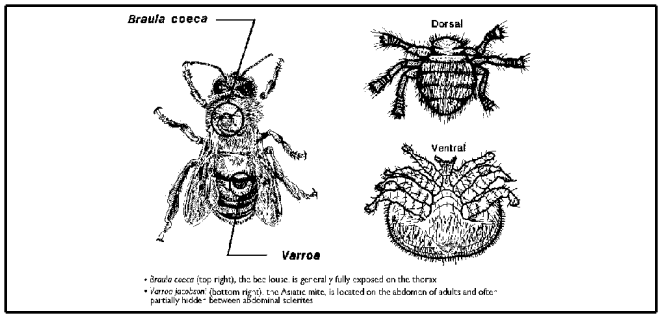
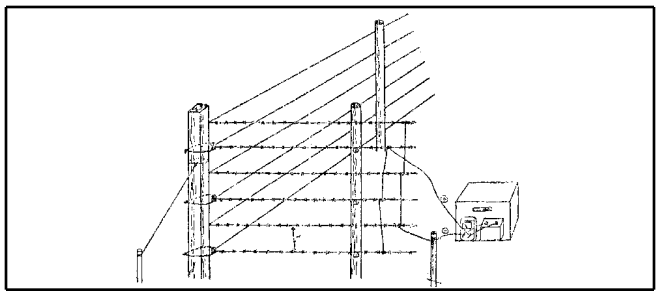


Figure 6.

Black Bear

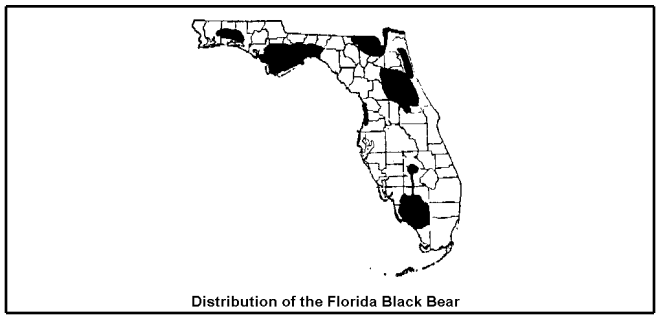
Because much of the prime bee forage in the United States is wild or feral in nature, honey bee colonies are often located in prime bear habitat. This is particularly true in the northeast, southeast and west. Black bear is a significant predator on colonies and does a great deal of mechanical damage to a colony. The key to avoiding bear damage is a well-maintained electric fence.

The fence must be put up before colonies are located in bear habitat , otherwise it often will not stop depredations. Florida research suggests fences to have two or more "hot" wires, one eight inches off the ground, the other about forty inches high, with perhaps a third in the middle. Woven wire is also recommended for an inside fence and a wire mat about two feet wide should be laid around the fence



electric fence.

base. Both fencing and mat should be connected to the ground wire of the fence controller. Controllers should be powerful enough to deliver 4,000 volts with a current of 20 mA.



bear habitat.

Indemnity payment to beekeeepers for bear damage does not exist in Florida. For information on controlling bear depredation, it is recommended beekeepers contact their nearest Florida Game and Fresh Water Fish Commission office. Some time back the Commission published, "Florida Black Bear-Beekeeper Conflict: 1981 Beekeeper Survey," *American Bee Journal*, Vol. 122, No. 5: pp. 372-375.

Man

Perhaps the greatest predator/pest of honey bees is man. Bees can be vandalized, stolen and/or burned. In addition, reduction of bee forage by large-scale agriculture and urbanization is deleterious to bee populations. A major threat is the proclamation of ordinances. Every beekeeper should, therefore, strive to become the best of neighbors.

Good Neighbor Guidelines for the Beekeeper

1. Place colonies away from lot lines and occupied buildings. If near buildings, locate colonies away from used entrances and lines of foot traffic.
2. Erect a six-foot barricade between the bees and lot line. Use anything bees will not pass through: dense shrubs, fencing. An alternate solution may be to place bees on a roof or platform. Any time bees are flying close to the ground and across the property line of a neighbor, there are potential problems.
3. Provide a watering source. If a natural water source is not located nearby, and especially if swimming pools are in the vicinity, a tub of water should be placed in the apiary with wood floats to prevent the bees from drowning. Water should be changed periodically to avoid stagnation and mosquito breeding.
4. Minimize robbing by honey bees. Work the bees during nectar flows if possible and keep exposed honey or sugar water to an absolute minimum. Use entrance reducers to prevent robbing of weak colonies. Robbing bees are usually aggressive and will be more likely to sting passersby.
5. Prevent swarming. Although swarming bees are considered to be not aggressive, the often feverish activity of a swarm and a large, hanging ball of bees may evoke fear in neighbors.
6. Keep no more than three or four beehives on a lot less than one-half acre. If more colonies are desired, find a nearby farmer who will allow bees to be kept on his/her land in exchange for some honey.
7. Work bee colonies when neighbors are not in their yards.

8. Requeen overdefensive colonies.

9. Give a pound or two of honey each year to the neighbors.

Ordinances

If all else fails and ordinances are considered by the town or city council, the following model can be looked to for guidance:

Section 1. Location of Beehives and Other Enclosures

It shall be unlawful for any person to locate, construct, reconstruct, alter, maintain or use on any lot or parcel of land within the corporate limits, any hives or other enclosures for the purpose of keeping any bees or other such insects unless every part of such hive or enclosure is located at least seventy-five (75) feet from a dwelling located on the adjoining property.

Section 2. Number of Hives (Colonies of Bees) Regulated

On lot sizes of 15,000 square feet or less, no more than four hives (colonies of bees) will be permitted. The hives shall be no closer than fifteen feet from any property line. On lots larger than 15,000 square feet additional hives will be permitted on the basis of one (1) hive for each 5,000 square feet in excess of 15,000 square feet.

Section 3. Type of Bees

This ordinance shall pertain only to honey bees maintained in movable-frame hives, and it does not authorize the presence of hives with non-movable frames or feral honey bee colonies (honey bees in trees, sides of houses, etc.).

Section 4. Restrictions on Manipulating Bees

The hives (colonies) of bees may not be manipulated between the hours of sunset and sunrise unless the hives are being moved to or from another location.

Section 5. Penalty

The violation of any provision of this ordiance shall constitute a misdemeanor punishable upon conviction by a fine not exceeding fifty ($50) dollars, or imprisonment not exceeding thirty (30) days; provided, that each day that a violation exists or continues to exist shall constitute a separate offense.

Section 6. Effective Date

This ordinance shall be effective from and after the _____of _____, 19__.

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Table 1.

Table 1. Temperatures Required to Kill All Stages of Wax Moth.

COLD			HEAT		
(F)	(C)	Time (hrs)	(F)	(C)	Time (min)
20	-7.0	4.5	115	46	80
10	-12.2	3.0	120	49	40
5	-15.0	2.0			