Basic Beekeeping
Michigan State University
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E. C. Martin, Department of Entomology
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Department of Entomology

BEEKEEPING IS AN IMPORTANT Michigan industry — for both the production of high-quality honey and pollination of more than $100 million worth of fruit, vegetable and seed crops each year. Beekeeping can also be a very satisfying hobby. Some suggestions for new beekeepers:

- Professional beekeeping is a skilled occupation. Don't invest too heavily until you have a few years experience on a small scale.
- Subscribe to one or more bee journals and read beekeeping books and bulletins.
- Write to several bee supply dealers for their catalogs and study the available equipment.
- Join the Michigan Beekeepers Association and your nearest local association.
- Buy or make all equipment only in standard sizes.
- Start in the spring with five or less colonies of bees.
- Purchase established colonies if available or if not buy package bees from the southern United States or through a local dealer. Mimeographed information on package bees is available from the Entomology Department at MSU. You may also increase your apiary by capturing swarms in May and June.
- Learn how to avoid stings, but be prepared to accept a sting occasionally. Swelling following a sting is normal but you will gradually become desensitized to sting poison and swell very little. Some people find that bee stings cause an extreme allergic reaction in addition to swelling. They should discontinue beekeeping and also seek medical advice.
- Register your bees with the Michigan Department of Agriculture.
- Learn how to identify and control American Foulbrood disease.
- Work for or with an experienced beekeeper for some time before expanding to a commercial operation.

Locating Your Apiary

A basic necessity for successful beekeeping is the presence of both nectar-secreting and pollen plants within easy flying distance of the apiary. Search back roads for apiary locations that will provide large acreages of alfalfa and other summer plants for surplus honey production. Such plants as willow, maple, dandelion and goldenrod provide minor flows to strengthen the colonies in the spring and fall. Professional beekeepers often place their apiaries many miles from home while sideline or hobby beekeepers

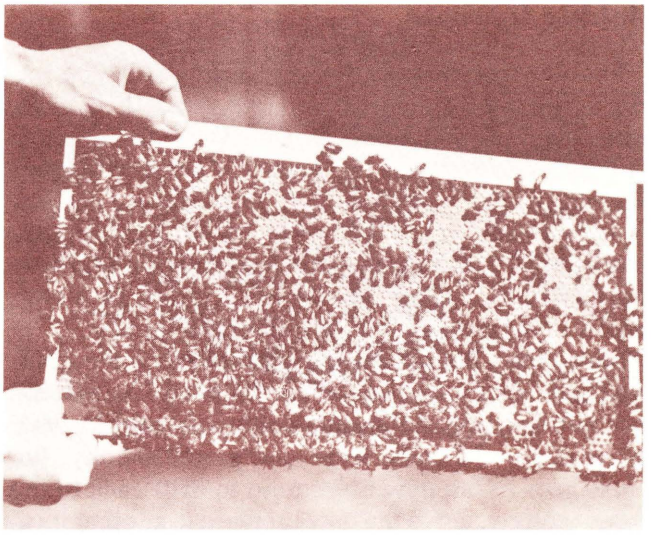
prefer to locate then close to home. When locating the apiary:

- Place large apiaries at least 1½ miles apart.
- Choose an accessible location, protected from the wind but exposed to the sun. The south side of a woodlot is best.
- When an apiary is located near roads, walks, or private property, place a high wall or hedge near the colonies so bees will fly over people's heads.
- Don't let your bees become a nuisance to neighbors. You may lose friends and force restrictive ordinances. If your apiary is a nuisance, move it to another location.
- Never neglect an apiary. It is against the law to leave used equipment exposed since it may spread bee diseases. Valuable honey combs in neglected apiaries are soon destroyed by Greater Wax Moth and other pests.
- Don't locate a permanent apiary too close to a commercial orchard — poison sprays may drift to nearby bloom and kill bees continually.

Management of Colonies

Well managed colonies usually produce a crop of honey. Poorly managed colonies often yield no surplus, and sometimes fail to survive. Some guidelines can help the beginner manage colonies. Increased knowledge of bee behavior and the yearly cycle of activities will enable the beekeeper to determine what needs to be done with a glance into a hive. Some management suggestions follow.

A fine location — wind-protected but sunny.



A solid patch of brood — indication of a good queen.

Spring Management

From March to mid-June, try to build colonies to a peak population of about 60,000 to 65,000 worker bees in time for the major honey flows of June, July, and August. For successful spring management:

- In early April, remove all hives that died during the winter. Dead colonies left open in the apiary may be robbed of their honey which may spread American Foulbrood disease. Also combs of dead colonies left in the apiary become moldy and difficult to clean.
- If package bees are purchased, install them about May 1. Established beekeepers with honey in drawn combs may successfully install packages in early April. Literature on package bees is available from the Entomology Department at Michigan State University.
- Examine colonies briefly every 7 to 10 days during spring and early summer to make sure they have plenty of food. Spring plants such as maple, willow, dandelion, fruit bloom, and yellow rocket usually permit colonies to build up adequate supplies of nectar and pollen. If food stores go below 15 pounds per colony, feed sugar syrup, mixed 1½ parts sugar to 1 part hot water. Do no use boiling water since the sugar will caramelize.
- At each examination, check for young brood or eggs to make sure that a laying queen is present. Examine the colonies thoroughly at least once in the spring for American Foulbrood.
- Bees need water, particularly in the spring. Provide a source of fresh water close to the hive.

Making Increase

You may increase your number of colonies by setting up new hives with brood, bees and food taken from established colonies. The best time to do this is early to mid-May during dandelion and fruit bloom time. Place three or four combs of mostly capped brood with adhering bees into the middle of an empty hive. Check carefully that the queen is not on these combs. Fill the remaining space in the new hive with combs of honey and pollen and empty combs.

Introduce a bought queen as directed on her mailing cage. Honey and brood combs used for increase may be taken from different hives but the bees for each increase should come from one parent colony. Because bees in the new hives tend to drift back to the parent colony, move the new increase to another location, at least two miles away for about two weeks. If this is not feasible, place a wire screen in the entrance of new colonies to prevent bee flight for 24 hours. In a good honey season, such increase may be expected to store some surplus honey.

It is also possible to make increase without buying a queen from the South. As in the above method, place three or four combs of bees and capped brood along with combs of honey and pollen and drawn combs or foundation into an empty hive. To provide a queen, add a frame containing eggs and young worker larvae, so they can raise their own queen. Or, add a frame containing a plump queen cell from a desirable type of colony that may be preparing to swarm. This type of increase will not likely gather surplus honey but such "nucs" (nucleus hives) can be among your best colonies the following year. Making too many nucs can weaken overwintered hives and reduce your honey crop, so weigh your need for increase against your desire for a honey crop.

Beekeeper's tools: a veil for protection, a smoker to subdue the bees and a hive tool for prying out combs.

Capturing a swarm.

A well managed colony can net over 100 pounds of honey in one year.

Swarm Control

Swarming is the honey bee's natural method of reproducing the colony by splitting into two parts, one of which leaves the hive. Before swarming, colonies rear new queens in easily-observed, peanut-shaped cells. The old queen leaves with about half the bees and a young queen replaces her in the original hive. The first swarm which leaves the hive (prime swarm) clusters nearby on the branch of a tree or some suitable object and should be retrieved and installed in an empty hive. If the swarm is not retrieved, it will be directed by scout bees to a new location, such as a hollow tree or inside the wall of a house. Swarming activity is most common from late May to early July.

Causes of swarming include: (**a.**) Lack of room in the hive — causing crowding of brood, bees, and stores in the brood chamber. (**b.**) Periodic poor flying weather during May and June which keeps field bees in the hive and adds to the congestion. (**c.**) Swarming on queen cells initially built to supersede a failing queen.

Swarming is undersirable because of the obvious reduction in population. Also, as long as the instinct to swarm is dominant, the bees remain in the hive and gather very little honey.

For a beekeeper with a small number of hives, queen cells can be removed from the combs every eight days. This may prevent a swarm from leaving the hive, but some of the following steps will be necessary to make the colony forget its desire to swarm and return to the job of bringing in a crop of honey.

- Reverse the brood chambers of colonies once or twice during the spring build-up period. That is, if the bees have access to two hive bodies, place the upper hive body below and the lower one on top. This will cause the colonies to rearrange the brood and honey areas, postponing development of the swarming instinct.
- Provide sufficient brood chamber room so the queen always has empty cells in which to lay. Add extra hive bodies in plenty of time for storing and ripening the honey crop.
- If swarming is still a problem shortly before the main honey flow, raise some frames of brood to new honey supers (new hive bodies) as they are added on top of the hive, and supply empty replacement frames to the brood nest. This relieves crowding in the brood area by providing empty comb for brood rearing and by drawing young nurse bees to the supers.

Pollen pellets trapped from bees (actual size).

Trapping and Feeding Pollen

It is practical to feed pollen supplement to some of your colonies from late February until natural pollen becomes abundantly available in April. This will sustain constant brood rearing throughout this period and result in greater colony strength in the spring. Once pollen feeding starts, a supply of pollen cake should be available at all times until natural pollen is available in quantity. Colonies strengthened in this way may be divided to make increase as suggested under "Making Increase."

The best time to trap pollen is late spring and early summer. Remove pollen from traps every two or three days to prevent infestation with ants, waxworm and other pests. Trap about a pound of pollen for every colony you wish to feed the next winter. Several types of traps are available from supply dealers. Pollen stored in the deepfreeze will keep indefinitely. It may also be dried by heating gently to prevent molding. Or, mix with half its weight of sugar, then cover with half an inch of additional sugar. In any case, seal tightly in containers.

To make pollen cakes, mix one part pollen, three parts expeller-processed soybean flour (purchased from a bee supply dealer) and about two parts concentrated sugar syrup (2 parts sugar and one part water). The cake should be of stiff dough consistency, neither runny nor crumbly. In early spring, add half a gram of sodium sulfathiozole to each pound of pollen supplement cake, to prevent American Foulbrood disease.

Place one cake (about five inches in diameter) on top of the frames, directly above the winter cluster of selected strong colonies. Cover the cake with paraffin paper to prevent drying. If cakes are too big they may stay on the colony too long and become moldy. A new cake should be added before the previous one is finished, or larvae being reared may die and brood rearing drastically reduced.

Summer and Fall Management

- Surplus honey may begin to build up in the hives as early as mid-June or as late as mid-July. Maximum honey flow time is quite variable in Michigan, making it necessary to watch the colonies for incoming nectar. The honey flow can be gauged by frequent weighings of a colony kept on platform scales. Honey supers must be added as honey stores increase in the hive.

- Light-colored, mild-flavored honey should be removed from the hives and extracted in mid-August. When needed to accommodate the fall flow from goldenrod, buckwheat, late alfalfa and other sources, supers should be placed back on the hives. Late honey is generally of a darker color and should be removed and extracted by mid-September, leaving plenty of honey for the bees' winter supply.

- Various methods can be used to remove bees from combs at extracting time: bee escapes, chemical repellents, brushing and shaking combs, and special bee blowers. Equipment necessary for all these methods may be obtained from bee supply dealers.

Wintering Bees

When the temperature drops, bees cluster closely together on the combs. Their bodies form such a good insulating mass that the temperature in the middle of the cluster may reach over 90° F, even on cold winter days. Temperature control within the cluster is so remarkably exact that normal colonies start brood rearing before the end of January in Michigan. To keep winter losses to a minimum:

- Leave 60 pounds or more honey and pollen for winter and early spring use. Total weight of a double brood chamber hive in the fall should be about 125 pounds. Complete supplementary sugar syrup feeding by mid-September.

- Re-queening annually or at least every two years helps keep colonies well stocked with strong, young, bees for winter. It is a good practice to kill poor colonies in the fall and replace them in the spring by dividing strong colonies or buying packages.

- Good windbreak for the apiary is important but do not shut out the sun. Wrapping colonies with one layer of tar paper helps the bees survive the winter. An upper entrance is also helpful.

Greater Wax Moth and several other insect pests will destroy stored combs. Combs being stored over winter or for an extended period should always be protected with paradichlorobenzene (P.D.B) crystals. Best winter storage is achieved by stacking hive bodies on an inverted cover with a sheet of newspaper on every third hive body. Place a handful of P.D.B. crystals on each sheet of newspaper and cover each stack of hive bodies with another hive cover. The crystals will evaporate and the fumes largely dissipate by the time hive bodies are to be used the following season.

Preparing Honey

Honey varies in flavor, color and other characteristics depending on the floral source of the nectar. For example, buckwheat honey is dark in color with a strong flavor. In most parts of Michigan, it is possible to extract light-colored honey from alfalfa, clovers, basswood, star thistle etc. in early or mid-August, and golden or amber-colored honey in mid-September.

To make beekeeping a success, it is important to learn how to extract and pack honey so that it is well-strained, low in moisture, free from foreign flavors, and retains its own natural flavor and aroma. Extract honey in a warm, dry place. Try not to expose supers of honey to high humidity since honey is hygroscopic and readily absorbs moisture. High moisture honey may ferment. Some beekeepers store supers of honey in a specially constructed drying room for a day or before extracting to insure a low moisture product.

It is very important that honey is not overheated at any stage of processing. Overheating drives off the natural, volatile flavors which make honey a unique product and chemically breaks down the levulose sugar. This darkens honey and gives it an off flavor.

There are four ways to produce and prepare honey for sale:

Section Comb Honey is served just as it comes from the hive. The beeswax cells are eaten with the honey making a more "chewy" and attractive product for many people. Good section comb honey is harder to

Honey prepared for sale in different forms.

produce than extracted honey. It is most successfully produced in areas where there is a rapid flow of light-colored honey.

Cut Comb Honey is comb honey produced in larger combs and cut by the beekeeper to smaller sizes. It is sometimes sold as "chunk" honey, immersed in a jar of liquid honey. Use a special thin comb foundation for all honey to be eaten in the comb.

Liquid Honey is extracted honey eaten in the liquid form. Commercial honey packers usually filter honey or use controlled heat to keep it liquid for several months. Honey that has crystallized can be reliquified by gently heating the container in a pan of water. Liquid honey is excellent on breakfast foods, pancakes, ice cream and fruits, particularly grapefruit. Plastic squeeze bottles are efficient dispensers for liquid honey.

Creamed Honey is a popular term used to indicate honey which has been made to crystallize smoothly so that is can be spread with a knife on bread or biscuits. The industry could benefit greatly from increased production and advertising of this product, provided high quality standards are maintained. A leaflet on small scale creamed honey preparation is available from the Entomology Department, Michigan State University.

The beginner who intends to make a profit selling honey in a consumer pack should learn all about the properties of honey and equipment needed to merchandise the finest product. Plan to pack neatly and attractively under spotlessly clean conditions and sell at adequate market prices.

Pollination of Crops

Bees gather nectar and pollen from flowers for their own use. In the process, they pollinate hundreds of different kinds of plants. About 90 commercial crops are pollinated by bees in the United States, including many Michigan crops — apple, pear, cherry, peach, plum, strawberry, raspberry, blueberry, cucumber, muskmelon, clovers and others. Without bees, these crops could not yield profitably.

Honey bees kept for honey production in agricultural parts of the state often pollinate crops, particularly back-yard crops, without cost to the grower. In commercial fruit or seed-growing, millions of blossoms must be pollinated in every acre. To supply enough bees to cover the blossoms and insure full yield under such conditions, it is necessary to move honey bee colonies into the field or orchard during the bloom period.

More and more opportunity exists for Michigan beekeepers to rent colonies for pollination of commercial crops. Beekeepers entering this business should study the specific requirements of the crops to be pollinated and be able to provide reliable service. This means offering strong colonies which will provide plenty of field bees, and delivery and removal of the colonies on time. Power equipment for lifting colonies on and off trucks is becoming widely used.

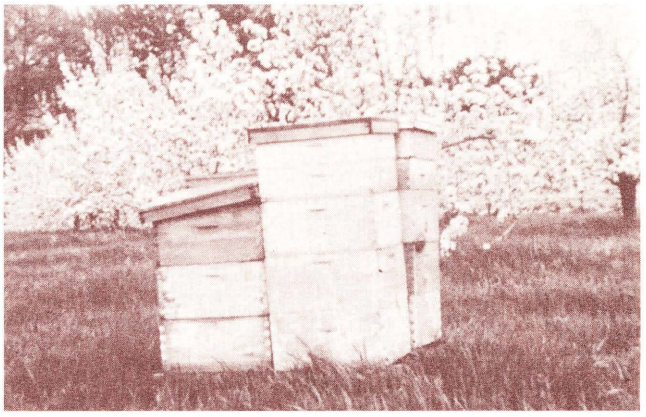
A pollination specialist, particularly in fruit, must be acquainted with the grower's spray schedule. There should be an understanding between the beekeeper and the grower that insecticides will not be used during the bloom period, to minimize spray damage to the bees. A brief, written contract can avoid misunderstandings. Check with your state association for suggested minimum charges.

Disease Control

Several diseases affect bees, some causing serious losses. The most important is American Foulbrood. All beekeepers should learn how to identify, prevent and control this disease. Otherwise, you can lose your bees and equipment. Learn how to prevent American Foulbrood by the use of antibiotics. Bees and beekeeping equipment are too expensive to lose to American Foulbrood.

American Foulbrood (A.F.B.)

This is a bacterial disease which kills brood. To keep the disease under control, the Michigan Apiary Law (1) requires that all beekeepers register their apiaries annually with the Plant Industry Division, Michigan Department of Agriculture, Lewis Cass Bldg., Lansing; (2) empowers apiary inspectors to locate and destroy diseased colonies; (3) requires that beekeepers obtain permits to move or sell colonies or used apiary equipment.

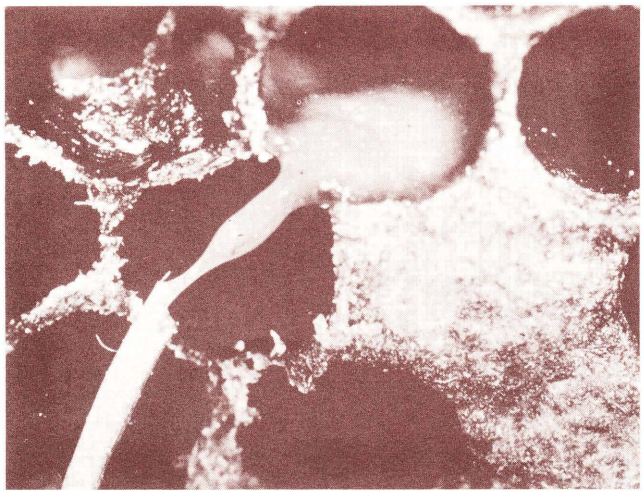


Bees in a fruit orchard.

Causative Organism. A.F.B. is caused by a spore-forming bacteria known as *Bacillus larvae*. Spores of the disease can survive in honey for many years. When honey containing these spores is fed to bee larvae, the spores germinate to their vegetative stage and reproduce in the body of the larva, causing death. Bacteria then pass from the vegetative to a tough, resistant spore stage. The dead bee larva gradually dries to a thin scale which lies along the floor of the cell. The scale contains millions of bacterial spores but it occupies so little space that bees store honey in the cell with it. Many spores then pass from the scale into the honey. When this honey is fed to young bee larvae, they die and the cycle is repeated. The inevitable end, if left along, is death of the colony.

Identification. Brood dies of American Foulbrood after the cell is capped, in the late larval (pre-pupal) or early pupal stage. Cappings on cells containing dead brood gradually become sunken and perforated with small holes chewed by the bees. After death, the larvae and pupae settle uniformly along the base of the cell. If death occurs in the pupal stage, the tongue (proboscis) may point towards the top of the cell. Color changes from the pearly-white of healthy brood to yellowish, and eventually coffee brown.

As dead brood dries out, it develops a glue-like consistency and for a time during the drying process will string out like glue if a toothpick is inserted into the body and withdrawn. Eventuallly, the brood dries to a dark scale which adheres tightly to the base of the cell and is difficult to observe. There are many books and bulletins available on A.F.B. If in doubt about identification, send a sample of suspected brood to the Michigan Department of Agriculture Laboratory, 1615 South Harrison, East Lansing, Michigan 48823.



Brood dead from A.F.B. develops a glue-like consistency.

Control. For many years, apiary inspectors and beekeepers have controlled A.F.B. by killing the bees in diseased colonies, burning all bees and combs and disinfecting hive bodies, covers, and bottom boards by scorching with fire. This is still the most effective way for the apiary inspection service to keep A.F.B. under control.

In recent years, sodium sulfathiozole and terramycin have been used for disease control. Different formulations and mixtures have been recommended. Here are some suggestions on their use:

- Feed antibiotics to prevent American Foulbrood unless you are sure no disease problem exists in the area.
- If you buy established colonies from another beekeeper, feed antibiotics spring and fall until sure there is no danger of disease being present.
- Only two drugs are authorized by the Federal Government for use to prevent American Foulbrood — sodium sulfathiozole and terramycin.
- Feed terramycin for prevention where no serious problem is known to exist in the area. But, if the inspector has destroyed some A.F.B. colonies and there is danger of more colonies coming down with the disease or a disease situation exists nearby, use sulfathiozole spray for at least one season.
- Feed drugs only during the spring period of about April 20 to May 15 and after the honey crop has been removed in the Fall.
- If a colony comes down with A.F.B after you have been feeding drugs correctly, destroy the colony. Otherwise you may be propagating a strain of the disease which resists present day preventive medication. If resistant strains of the disease become widespread, we will lose a valuable tool in the control of A.F.B.
- Don't try to cure diseased colonies with antibiotics or you will end up with infection all through your equipment and need constant attention to keep it under control.
- If you have a continuing problem with A.F.B. and suspect widespread infection in your equipment, extract all honey from all or selected colonies in late fall, kill the bees, melt and save all wax from the frames. Either burn frames and scorch hive parts with a blow torch or boil frames and hive parts in lye water. Rendering of combs should be done in the winter when no bees are flying and spread of disease by robbing cannot occur.
- To feed terramycin, mix one part TM 25 (a terramycin formulation) and six parts confectioner's powdered sugar. Ask a local baker to get you the sugar or

let you know of a source of supply. Buy only enough TM 25 for one season at a time because it loses strength with age. Sprinkle a full tablespoon of the TM 25 sugar mixture along the top bars of the brood chamber. Start the feeding in April and repeat three times every 4 to 7 days. Always stop antibiotic feeding about four weeks before any major honey flow. When all surplus honey has been removed from the hives in the fall, repeat the medication, giving two TM 25 and sugar treatments a week apart. Terramycin loses its potency in liquids so is best fed as a powder.

■ If the danger of A.F.B. seems more imminent, use sulfathiozole. For example, if the inspector has destroyed some of your colonies, use sulfathiozole to eliminate or at least reduce the danger of the disease breaking out in additional colonies. Dissolve ¼ teaspoon of soluble sodium sulfathiozole in one half cup of water and mix this well into a gallon of sugar syrup (1 part sugar to 1 part water by volume). Use the right amount of sulfathiozole — no more, no less.

Spray or sprinkle the sulfa syrup along, and between, the top bars and the bottom bars of each hive body, of each hive, so that as many bees as possible become wet with the syrup. A garden compression sprayer, which has never been used for any insecticide, works well. Syrup can also be sprinkled from a jar through a syrup feeder cap. The bees lick the syrup from each other and this quickly brings about wide distribution of the medication and more immediate effect in checking disease.

A second "gorging" spray increases the chance of syrup being fed to all larvae. To give a "double treatment" apply a second sprinkling soon after the bees have cleaned the first syrup from themselves and the combs, usually in 25 or 30 minutes. In cleaning up the second treatment, the bees will be forced to deposit some syrup in cells and thus more widely distribute it in their food for greater continuing effectiveness. This sequence of treatments should be repeated at least three times at 3- to 7-day intervals. When the danger of A.F.B. in the apiary has lessened, switch to TM25 until no problem exists.

■ A beekeeper who prefers not to use drugs for disease prevention must use other techniques to keep A.F.B. under control. Keep a sharp lookout for A.F.B. all during the active season. If it is found, kill the bees in the infected colony and burn bees and combs in a pit in the ground. When everything is completely burned, refill the pit with soil making sure no honey or dead bees remain on the surface. Disinfect hive bodies and other parts with a blowtorch. It is possible to melt down honey comb during the winter as explained earlier in this section.

European Foulbrood (E.F.B) This bacterial brood disease is not as serious as A.F.B. but can be quite troublesome in some apiaries. E.F.B. usually kills larvae before the cell is capped. Dead larvae do not develop the glue-like consistency characteristic of A.F.B. Terramycin is used to control E.F.B. but requeening may also be effective. The disease frequently disappears as the season advances.

Sacbrood is a fairly common brood disease which is annoying but not fatal to the colony. The causative organism is a virus which kills fully developed larvae, making their insides watery and the skin tough. The larva hangs like a watery sac if lifted on a toothpick. Control requires a good queen and build-up of the colony in the spring to make it strong enough to overcome the disease as the season advances.

Nosema disease is caused by a protozoan parasite which lives in the intestines of adult bees. The disease is widespread and fluctuates in most apiaries. it can shorten the life of individual bees, contribute to queen failure and possibly to dysentery and death in overwintering bees. Not easily identified, the disease may be reduced by cleaning off dysentery-spotted frames and supplying clean water near the colonies. For serious cases, feeding Fumadil-B can be beneficial. Package bees from the South are often infected with Nosema. When the use of packaged is an important part of the beekeeping enterprise, Fumadil-B should be fed in syrup, as packages are installed.

Beekeeping Literature

Books. It has been said that more has been written about bees than any animal other than man. Bees and honey have stirred the imagination of writers and poets through the ages. The following modern books deal with bee life history, bee behavior and keeping bees for both pleasure and profit. Books and more complete lists are available from major bee supply companies. Ask your local library to stock interesting bee books.

The Hive and the Honey Bee, 1975 edition (Dadant and Sons, Hamilton, Ill. 62341)

ABC and XYZ of Bee Culture, by A. I. Root. (A. I. Root Company, Medina, Ohio 44256)

Beekeeping, by J. E. Eckert and F. R. Shaw. (The Macmillan Company, New York)

The Complete Guide to Beekeeping, 1974 edition, by Roger Morse (E. P. Dutton & Co. Inc., New York)

Starting Right With Bees, (A. I. Root Company, Medina, Ohio 44256)

First Lessons in Beekeeping, (American Bee Journal, Hamilton, Ill. 62341)

How to Keep Bees and Sell Honey, (The Walter T. Kelley Company, Clarkson, Ky. 42726)

The How-To-Do-It Book of Beekeeping, by Richard Taylor (Walnut Press, Naples, N.Y.)

Honey Plants Manual, by Harvey B. Lovell, (A. I. Root Company, Medina, Ohio 44256)

Queen Rearing, by H. H. Laidlaw and J. E. Eckert. (University of California Press, Berkeley, Calif. 94720)

The World of the Honey Bee, By Colin G. Butler (The Macmillan Company, New York)

The Behavior and Social Life of Honey Bees, by C. R. Ribbands (Dover Publications, Inc., New York)

Bees: Their Vision, Chemical Senses and Language, by Karl von Frisch (Cornell University Press, Ithaca, N.Y.)

Bulletins. The USDA and many states publish bulletins dealing with many aspects of beekeeping.

Motion Picture Films (16mm). Films about bees are available for short-period rental from Instructional Media Center, Michigan State University, East Lansing, Michigan 48824. Write weeks in advance to book them. Charges vary. Following are some titles:

Bees for Hire. Color. 24 minutes.
Marvels of the Hive. Color. 25 minutes.
The Honey Bee — A Profile. Color. 10 minutes.
Pollination of Alfalfa in Utah. Color. 25 minutes.
Secrets of the Bee World. Color. 13 minutes.
Social Insects: The Honey Bee. Color. 24 minutes.
Flowers at Work. Color. 11 minutes.

Journals. Reading a bee journal regularly is important to success and enjoyment in beekeeping. Following are the most useful journals in Michigan.

American Bee Journal. Hamilton, Ill. 62341
Gleanings in Bee Culture. Medina, Ohio 44256
Bee World. Hill House, Chalfont St. Peter, Gerrards Cross, Bucks., England. SL90NR
(This is a publication of international interest published by the Bee Research Association which also publishes Journal of Apicultural Research and Apicultural Abstracts.)

Information and Help

Other information and assistance is available from the following agencies:

Michigan State University, Department of Entomology, East Lansing 48824. A program is carried on in teaching, research, and extension relating to practical and scientific phases of apiculture and pollination. Assistance is given beekeepers through correspondence, meetings and association affairs. Other literature is available on request.

Michigan Department of Agriculture, Plant Industry Division, Lewis Cass Building, Lansing 48913. This agency carries out a program of apiary inspection for disease control, registers apiaries and issues permits to move or sell colonies or used equipment.

United States Department of Agriculture

(a) Operates six federal bee research laboratories, and cooperative research projects with different states.
(b) Agricultural Stabilization and Conservation Service. Michigan office; 1405 S. Harrison, East Lansing 48823. This agency administers the price support programs and indemnity for bee losses caused by pesticides.
(c) Fruit and Vegetable Division, Consumer and Marketing Service, Washington, D.C. 20250. This agency prepares a monthly report entitled "Honey Market News" which lists crop reports and market prices from all parts of the country.

Bee Supply Companies. Michigan is well serviced by bee supply manufacturers, dealers, and honey packers. Bee supply manufacturers have useful catalogs and lists of equipment available on request. Manufacturers will usually order package bees for you.

Beekeeping Organizations

Michigan Beekeepers' Association (M.B.A.), the oldest, continuously-functioning agricultural organization in the state celebrated its 100th anniversary in 1965. Some of the vital services it has performed for the beekeeping industry include education, business aids, leadership in developing needed legislation and discussion forum, as well as fellowship, fun, and opportunities for contact between professional beekeepers, hobbyists, manufacturers, honey packers, growers of bee-pollinated crops, etc. An annual picnic meeting is held in July and a busi-

ness meeting in December. Support of this organization is important to the welfare of Michigan beekeeping.

Regional Associations. Several counties or groups of counties have local or regional associations, some with very active programs. Meetings are of social, educational and business value. Your county agent or other beekeepers may help you make contact with these groups.

Farmers' Week Meetings. Each year the Michigan State University Entomology Department sponsors a two-day educational meeting for beekeepers. This is usually held in Kellogg Center on the campus. Annual Farmers' Week announcements specify time and date.

State and County Fairs. The State Fair and several county fairs include honey and other apiary products in the prize list. Responsibility for developing apiary sections at even more county fairs is in the hands of local associations or individual beekeepers. Fairs provide an excellent opportunity to inform the public about the uses of honey and the importance of bees.

Boys and Girls' Clubs. Many beekeeping clubs, with varying degrees of success, have existed in Michigan. These are often associated with 4-H and Vocational Agriculture organizations. Their development and success usually hinge on the knowledge and dedication of a local beekeeper leader. Leaders are badly needed and interested beekeepers should make themselves known to their county 4-H agent. Clubs can deal with colony management, making equipment, packing honey in its different forms, the study of bee behavior, crop pollination, honey plants, bee diseases and other interesting aspects of apiculture. While individual club members may purchase colonies, this can be quite expensive. Usually, it is best to develop a club apiary which will be available year after year, even though club membership changes. After one or more seasons of experience, some club members will want to purchase hives of their own.

GLOSSARY OF TERMS

American foulbrood — Brood disease of honey bees caused by spore-forming *Bacillus larvae.*

Apiary — Several hives of bees at one location.

Apiculture — Scientific study of bees and the art of caring for them for economic benefit or pleasure.

Bee blower — Device used to blow bees from combs when removing honey from hives.

Bee escape — Device which permits bees to pass one way and prevents their return. Used to remove bees from honey supers and buildings.

Bee hive — Bee home containing frames of honey comb, cover and floor for one or more hive bodies.

Beeswax — Complex material secreted by glands on underside of worker bee's abdomen. Used to build honey comb and cap cells of honey.

Bee veil — Cloth or wire veil used to protect head and face from bee stings.

Bottom board — Floor of a bee hive.

Brood — Immature stages of honey bee — eggs, larvae and pupae.

Brood chamber — One or more hive bodies in which queen is laying eggs and brood being reared.

Brood rearing — Raising young bees from eggs.

Capped brood — Brood in pre-pupal and pupal stages, sealed in cells by the bees until they develop into adults.

Capping — Thin wax covering of cell full of honey. Removed with hot knife before extracting honey from comb.

Cell — Hexagonal compartment of honey or brood comb.

Cluster — Group of bees clinging together after swarming; bees crowded together for heat conservation in the winter.

Colony — Family of worker bees, drones and a queen bee living together in a hive.

Comb — Groupings of hexagonal cells facing both ways from a midrib, made of beeswax by honey bees. Used to rear brood and store pollen and honey.

Comb foundation — Man-made sheets of beeswax embossed with the base of worker cells on which bees construct complete cells to form comb.

Comb honey — Honey produced and sold in the comb in small wooden sections.

Crystallize — Hardening characteristic of honey; caused by high dextrose to levulose content. More common in honey produced in northern states. Easily reliquified by gentle heat.

Cut comb honey — Bulk comb honey cut into pieces, drained and wrapped for sale.

Drone — The male honey bee.

Dysentery — Diarrhea-like condition of adult bees. Caused by unfavorable wintering conditions — low-quality food, excessive moisture and Nosema disease.

Entrance — Opening in the hive to allow bees to pass in and out.

European foulbrood — Brood disease of bees caused by *Streptococcus pluton* and associated organisms.

Extracted honey — Honey removed from combs with a centrifugal extractor.

Fertile queen — A queen which has mated and can lay fertile eggs.

Field bees — Older worker bees which have taken over the duties of collecting nectar, pollen, water and propolis.

Frames — Rectangular, wooden honey comb supports, suspended by top bars within each hive body.

Hive tool — A metal tool used to open hives, pry frames apart, clean the hive, etc.

Honey — The main product of the hive, made from nectar of plants gathered and ripened by bees.

Honey flow — Period when nectar is available in the field and bees are gathering it.

Honey super — Hive body in which bees store surplus honey; usually placed above brood chamber.

Laying worker — A worker which lays eggs that produce only drones. Usually develop in colonies hopelessly queenless.

Levulose — Non-crystallizing sugar causing dark color of overheated honey.

Nectar — Sweet exudation of plants, usually secreted by cells within the flower.

Nosema disease — Intestinal disorder of adult bees caused by the parasite *Nosema apis*.

Nurse bees — Worker bees, normally under 10 days old. Responsible for first feeding royal jelly and later other foods to developing larvae.

Observation hive — Glass hive used for observation of bees at work.

Package bees — Wood and wire-screen package of worker bees with a queen. Purchased from southern states to start an apiary or increase colony numbers.

Pollen — Male element of plants, carried to the hive as pellets packed on the hind legs and stored in cells for future use as high protein food.

Pollen supplement — Pollen trapped from bees and mixed with soybean flour for additional protein food.

Pollen cake — Pollen supplement mixed with honey or sugar syrup and formed into dough-like cake for feeding bees.

Pollen trap — Device which forces bees entering hive to walk through a 5-mesh screen, removing pollen pellets from their legs into a collecting tray.

Pollination — Transfer of pollen from anthers to stigmas of flowers. Honey bees are important agents of pollination.

Propolis — Resinous material collected from trees and other plants by bees to strengthen comb, close up cracks, etc. Also called bee glue.

Queen — Egg-laying bee in a hive. Becomes fully-developed female by continuous feeding of royal jelly throughout her larval period.

Queen cell — An elongated cell, specially constructed for rearing a queen bee.

Queen excluder — Device made of wood and wire with openings about .163 inch to permit worker bees to pass though but exclude queens and drones. Used to restrict the queen to certain parts of the hive.

Ripening — Process whereby bees evaporate moisture from nectar and convert its sucrose to dextrose and levulose, changing nectar into honey.

Rendering wax — Melting old combs and cappings and removing refuse from the resulting beeswax.

Requeen — To replace a queen in a hive. Usually an old failing queen is replaced with a young queen.

Robbing — Bees steal honey from other hives. Common problem when nectar not available in the fields.

Royal jelly — Glandular secretion of young worker bees, used to feed the queen and young brood.

Scout bees — Worker bees searching for nectar or other needs, including suitable location for a swarm to nest.

Social insect — Insects living in a family society with parents and offspring sharing a common dwelling place and exhibiting some degree of mutual cooperation, e.g. honey bees, ants, termites.

Super — See honey super.

Supersede — Worker bees rear a new queen to replace failing mother queen while she is still active in the hive.

Surplus honey — Honey removed from hives by the beekeeper; should be over and above that needed by the bees for their own survival.

Swarm — About half the worker and drone bees as well as the queen which leave the mother colony to establish a new colony. Swarming is the bees' instinctive method of propagation. Beekeepers try to prevent swarming to avoid weakening colonies.

Wax moth — A moth, the larvae of which damage brood combs and sometimes honey cappings.

Wild bees — Used here to mean bees other than honey bees.

Worker bee — Female bee with imperfectly developed reproductive organs. Responsible for carrying on routine work of the colony.

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