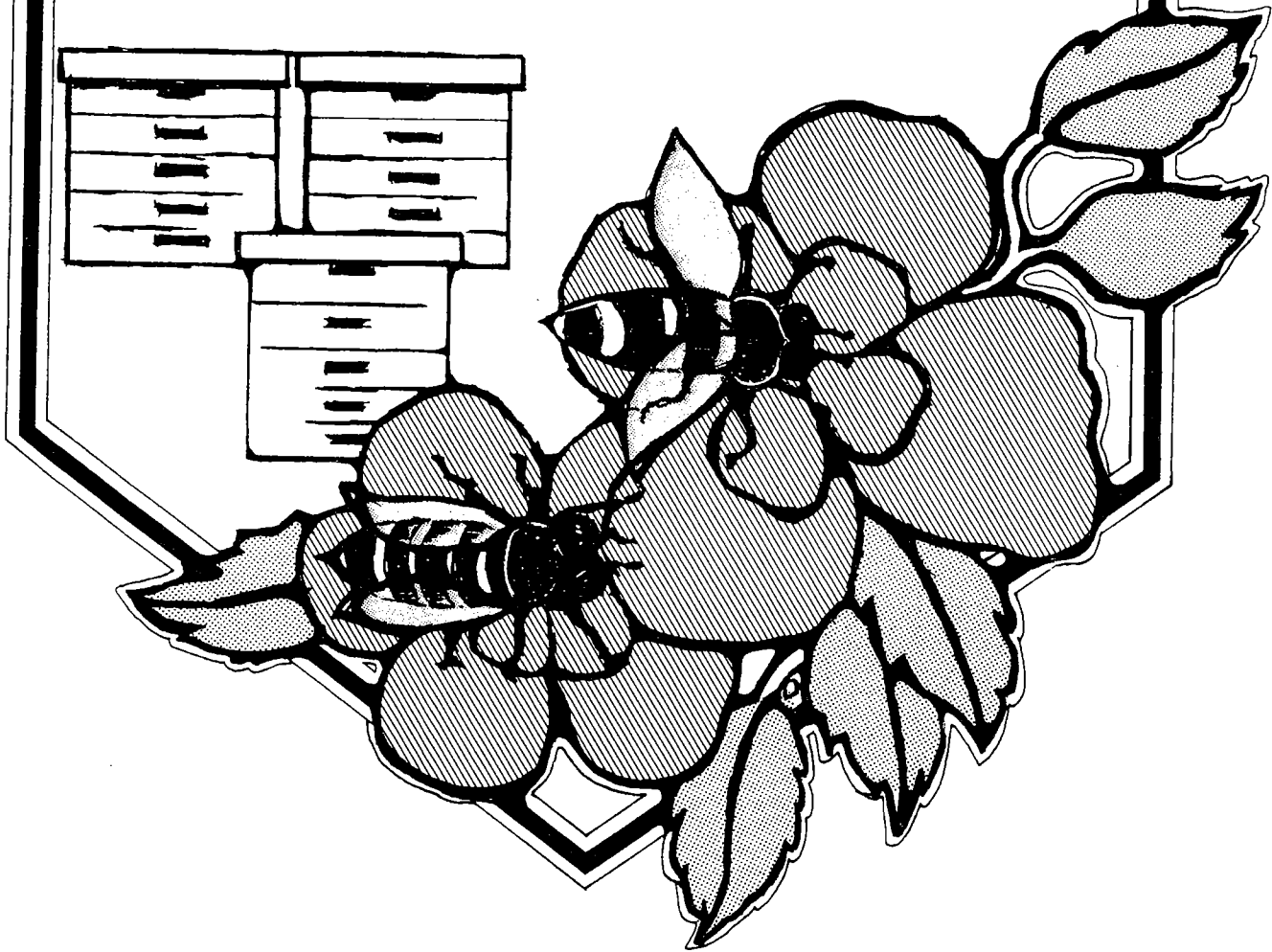




4-H BASIC BEEKEEPING MANUAL



NAME _____ AGE _____

ADDRESS _____

CLUB NAME _____ LEADERS NAME _____

4-H Basic Beekeeping Manual

By

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Institute of Food and Agricultural Sciences
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Name _____

Club _____

BASIC BEEKEEPING PRE-TEST

1. The honey bee is an insect because it has:
 - a.
 - b.
 - c.
2. Name the three individual insects of a honey bee colony, the number in each colony and what each is responsible for:

<u>Name</u>	<u>Number</u>	<u>Responsibility</u>
-------------	---------------	-----------------------

- | | | |
|----|--|--|
| a. | | |
| b. | | |
| c. | | |
3. Why do people keep bees?
 - a.
 - b.
 4. The most important beekeeping tools are:
 - a.
 - b.
 - c.
 5. The diet of honey bees consists of:
 - a.
 - b.
 6. Key nutrients required by honey bees and humans are:
 - a.
 - b.
 - c.
 7. Name the parts of the bee hive.

A BASIC BEEKEEPING MANUAL

Have you heard of "the birds and the bees"? This expression is sometimes used to teach humans about their own behavior. What do the birds and bees do that applies to humans? Actually, a whole lot more than you think.

Birds and bees are animals, for example, and so are humans. Birds and bees must eat, move, reproduce and respond to the environment. So must humans. Humans also obey the same rules the birds and bees do when interacting with the environment. What rules? Those of physics and chemistry which govern all life on the planet earth.

These rules are fixed and cannot be changed. Plants, for example, are the only living things that can manufacture food. Without them, no life as we know it would exist. Plants produce food by converting energy received from the sun along with certain elements found on earth into leaves, stems and roots. Animals then eat the leaves, stems and roots to build up their bodies. Birds consume worms which have eaten soil, consisting of the remains of plants and animals incorporated into decomposed rock. Humans eat plants too, lettuce, broccoli, potatoes and rice. We also consume other animals which are plant eaters, like chickens, pigs, sheep, cattle and fish. Bees, on the other hand, only eat plant materials, the pollen and nectar or sweet juices of plants. They never eat other animals.

This 4-H manual is about honey bees. It explains the reasons for keeping bees and tells how to get started in beekeeping projects. A guide is also provided to form a bee club so you and your fellow 4-H club members will become better beekeepers.

What is learning beekeeping?

1. Learning about others.
2. Learning about insects.
3. Learning about bees.
4. Learning about life.

When finished with this booklet, you should be able to:

1. Tell why a bee is an insect
2. Name the three individuals of the bee colony, the number present in each colony and the duties of each
3. Name the parts of the beehive
4. Put a frame together
5. Assemble a beehive from the ground up
6. Put on a bee veil
7. Name the most valuable beekeeping tools
8. Write for bee catalogs and bee publications
9. Find beekeeping information.

Why people keep bees:

1. To harvest honey and wax
 2. To learn about bee society
 3. To get out-of-doors near nature
-

ORDER AND SOCIETY

Why do people keep bees? One reason is to collect honey, another is because honey bees and humans are very much alike. We can learn about how we interact with the environment and more about ourselves by studying and comparing our situation with that of the honey bee's. Honey bee society is extremely ordered. We humans also look for order in this world. Not to have order means random events, called chaos, will occur. What if, when you were being driven to the grocery store, there were no stop signs and cars were going both ways in all lanes on the street? You'd probably never reach the store. In fact, nobody could go anywhere. Traffic lights and painted lines on the road all provide the necessary order for cars to move.

Because we seek order, we have become social animals. The rules which we live by are called a society. We have learned over the years that an ordered society protects every citizen and promotes harmony contributing to production for the benefit of all.

Have you ever been scolded and sent to your room? You probably violated the rules of society. You were unsociable and punished for it. Our society is very young, perhaps less than three million years old. It also varies in different parts of the world. The Moslem society of India and the Middle East doesn't allow its members to eat pork, but others such as the Christian society of Europe and the West don't care if their members eat pork. In the United States, our society is extremely flexible. We can move to California without having to get permission, whereas in the Soviet Union or mainland China, citizens often must apply to the government even to leave the city they're living in.

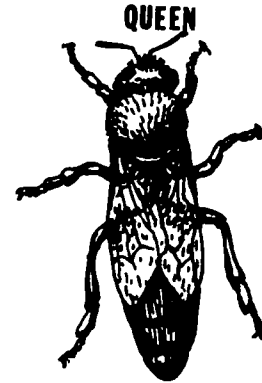
Honey bee society is far more ordered than human society. One reason is because it is very old, around 80 million years! That means honey bee society is over 26 times as old as ours. Honey bee society is not as flexible as human society. We can, if necessary, exist alone for a long time. Honey bees can't because an individual in bee society cannot perform the functions of the others. Really, we shouldn't talk about single bees, but a colony of honey bees. Without the colony structure, individual bees have no future. Beekeepers usually do talk about bees in terms of colony. Do you know a beekeeper? How many colonies of honey bees does he have?

Humans are individuals. You are different than your brother or sister. But, we are also composed of colonies of like units called cells. We have a skin made up of skin cells, a liver of liver cells and a kidney of kidney cells. Our kidney is a colony of cells which has one function, to rid our body of waste products. A human without a kidney is like a bee colony without any cleaning bees. So honey bees may be looked at as the individual cells of a colony.

RESIDENTS OF THE BEE COLONY

Let's take a peek at a honey bee colony now so that later you'll be able to understand how it operates. This knowledge will also make you a better beekeeper and help you produce more honey. Remember, no honey bee colony can exist for long without its societal structure.

There is only one female in the colony capable of laying fertilized eggs. She is extremely important, because without her no young bees would be replacing the old bees as they die. The rest of the bees pay a lot of attention to her. They treat her royally, so she's been named the queen by beekeepers. There is only one queen in a bee colony, and she may live 2 to 5 years. She must be fed by the others in the colony, and the queen can do none of the rest of the chores that need to be accomplished to make honey and keep a clean nest.



The Queen:

1. Lays fertile eggs.
2. Lives years.
3. Is female.
4. Is present as only one per colony.

The majority of bees in a colony perform most of the functions bees are known for like making honey and stinging for defense. These are called workers, and although they are females, they cannot lay fertilized eggs. There may be over 60,000 workers in a colony though the average figure for the whole year is 30,000.



The Worker:

1. Lays no eggs.
2. Does all the work.
3. Is female.
4. Lives 40 days.
5. 30,000 to 60,000 exist per colony.

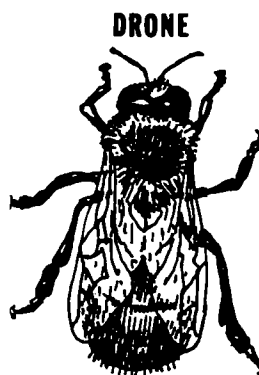
Workers live only 40 days in the summer, but may live several months during winter. Some gather honey and pollen in the field; others process the honey. Some are skilled builders; others are air conditioning specialists. Usually, the workers perform their duties based on age. The younger ones are cleaners and helpers, the same as you might help your mother with the dishes, whereas the older more experienced bees do the building and foraging in the field.

Finally, there's the single male bee in the colony, the drone. There may be several drones in the spring and summer, but sadly, they are all eliminated in the fall and winter when their services are no longer wanted. The drone exists only to fertilize or mate with young queens as far as we know, and he typically lives 40 to 50 days. Some beekeepers have called the drone fat and lazy. He certainly is bigger around than either the queens or workers, but nobody has asked bees if they agree he's lazy. We simply don't know what other functions the drone has in a colony.

In fact, there's a whole lot we don't yet know about honey bee society. Thus, beekeeping is a kind of craft. It's more art like painting a picture, than science like boiling water. A good beekeeper must combine the knowledge he has of a bee colony with his experience to help the insects out at certain times of the year.

The Drone:

1. Mates with queen.
2. Does no work.
3. Is male.
4. Lives 40 days.
5. Several thousand exist in summer; none in winter.



HUMANS, INSECTS AND BEES

Honey bees are insects, a certain kind of animal which usually has six legs, three main body regions, and an outer hard skeleton. That's different than humans who are mammals, and have two legs, two arms, two body parts and an interior skeleton of bones. We also can control our body temperature and are called warm-blooded. Have you ever had a fever? Your temperature was too high. Bees can't have a fever in that sense, and when they get cold, unlike humans, they stay cold until the sun shines to warm them up. That's called "cold-blooded". Other cold-blooded animals besides insects are fish, amphibians like frogs and reptiles like turtles. All the individual bees as a group, though, can cluster together to warm the colony, and in the process keep their individual temperatures up when its cold outside.

Insects (Entomology)

1. Three body parts.
2. Six legs.
3. Winged.
4. Hard outer skeleton.
5. Cold blooded.
6. Society 80,000,000 years old.

Humans (Anthropology)

1. Two body parts.
 2. Two legs.
 3. No wings.
 4. Inner skeleton of bone.
 5. Warm blooded.
 6. Society 3,000,000 years old.
-

The study of insects is called entomology. So when a scientist studies honey bees, he's likely to be called an entomologist and bee exhibits at science fairs are often categorized as entomology. Entomology is a well-known and growing field of study which will continue to expand in the future. Many an entomologist has been given the first taste of what was to become his life's work by keeping a colony of honey bees.

Wild Animals

honeybees
bears
song birds
buffalo

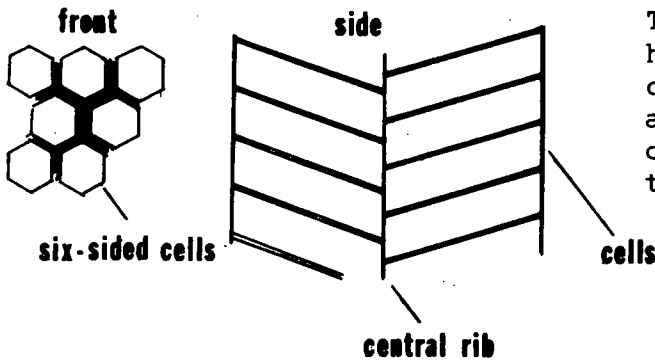
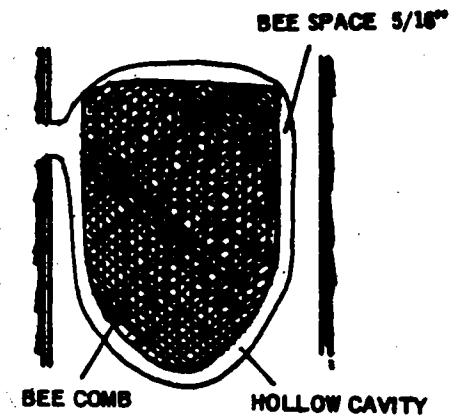
Domestic Animals

dogs
pigs
chickens
cattle

Humans keep bees, but the insects are not considered domesticated in the sense of the dog, cat or cow. It makes no difference to the bees whether they live in a hollow tree or in a man-made hive in the backyard. They are, therefore, not totally dependent on humans, but beekeepers can help the bees along and stimulate their activity for both the insects' and their keeper's sake. One of the beekeeper's first tasks, however, is to get the bees into a situation so they can be inspected and looked at on occasion. A hollow tree is not suitable for this at all.

THE BEE'S HOME

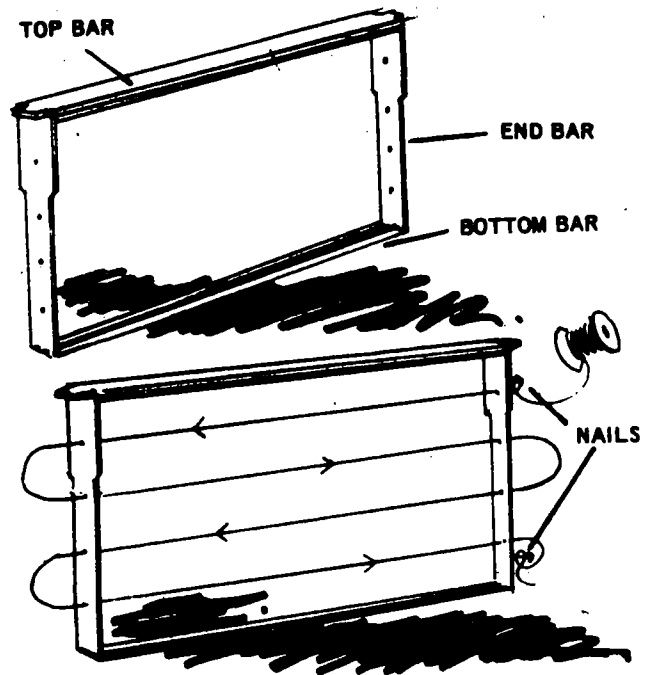
So we keep honey bees in man-made houses called standard beehives. The standard beehive was developed around 1851 and has changed little since. It was discovered by beekeepers that the bees didn't fill gaps in a colony with either wax or glue if they measured five-sixteenths of an inch. The standard beehive is based on this gap, called the bee space. When this space is conserved, a comb can be easily removed for viewing. Here we see a comb in nature with open bee space around it.



The comb is constructed of wax. It has a central rib with six-sided cells constructed on each side. The cells are the storage area for the bee colony and at the same time serve as the nursery for rearing young bees.

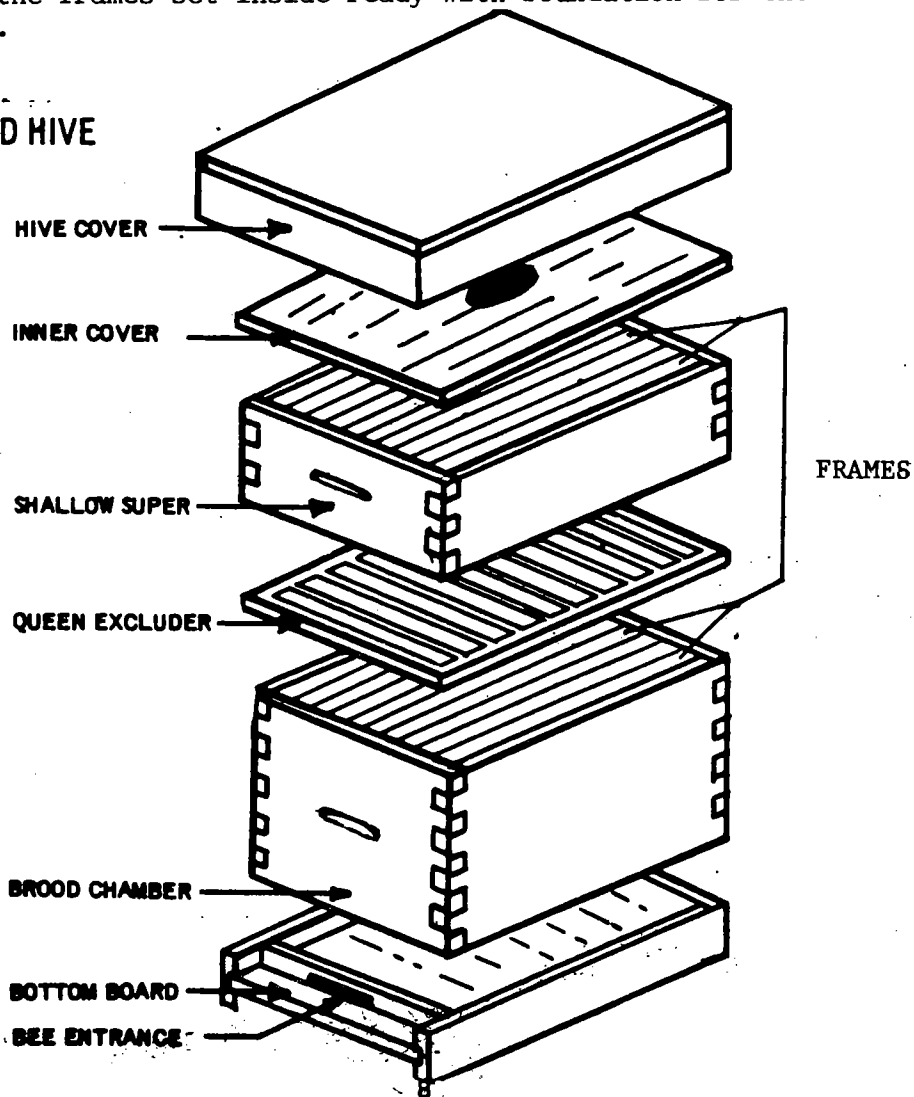
The standard beehive provides ten wooden frames or racks for the bees to build comb in. The frames reinforce the comb so it can be handled without fear of breaking the delicate wax. Sometimes wires are provided horizontally as shown here to further strengthen the comb when it's built:

Usually the beekeeper provides a starter sheet of wax to give the bees a guide for building. This is called foundation, and sometimes has ten vertical wires which also give strength to the finished comb. The horizontal wires are threaded through holes in the frame's end bars, pulled taut with pliers and tied off at small nails hammered in the end bar.



Now let's look at the other parts of the beehives. Here is a hive ready to be put together. Do you see the slats pictured in the tops of the boxes? Those are the frames set inside ready with foundation for the bees to go to work on.

STANDARD HIVE



The beehive sits on a bottom board which provides the colony with protection. An entrance cleat is pictured to use during cold weather when a smaller entrance is desired. On the bottom board sits the brood chamber.

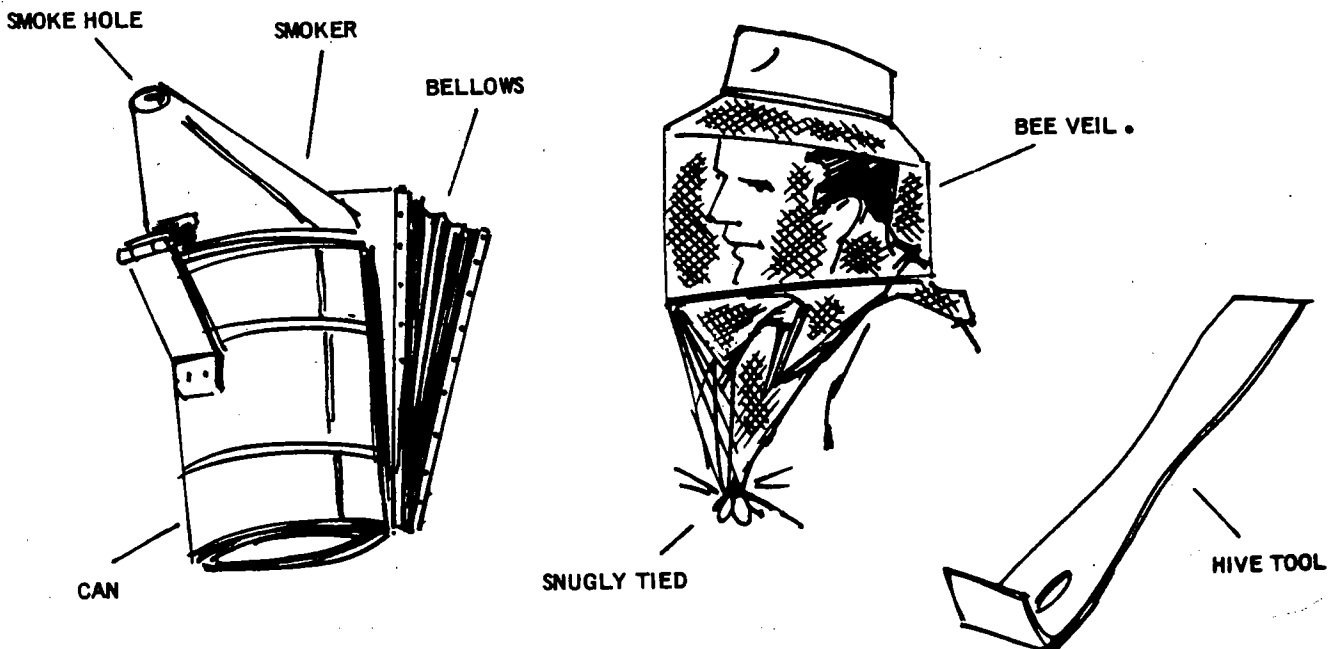
Brood is a term used to identify all the stages of young bees. Have you heard of a broody chicken or brood mare? That's a chicken with eggs or young and a female horse capable of giving birth. Do you remember the individual bee responsible for all the brood? The brood chamber is where the brood is reared. Some beekeepers use two brood chambers for their colonies, although only one is pictured here. Beginners usually start with a single brood chamber.

Above the brood chamber is a shallow super. This is where the honey will be stored. It also has combs in frames just like the brood chamber only they are not as deep. A queen excluder confines the queen to the brood chamber so she cannot lay eggs in the honey super. Finally, the whole array of boxes is topped by an inner cover usually with an oblong hole in the center and an outer cover to keep the rain out. Several other specialized pieces of equipment are sometimes used on a beehive. You should contact your county extension agent for information he might have on bee equipment or look in reference books for advice on when to use such equipment.

BEEKEEPING TOOLS

The standard beehive is the key to effectively keeping bees. There are, however, some other tools you must have to safely and effectively examine a beehive. The first and perhaps most important is the veil which covers the head. Many kinds of veils are advertized in beekeeping catalogs. Get a good one and tie it snugly to keep the bees out.

A beekeeper should also have a smoker. A fire is built in the can and the attached bellows are used to blow smoke onto the bees to quiet them. Be careful with fire. Let an experienced beekeeper light the smoker for you until you feel confident in doing so. Finally, there is the hive tool used for leverage to pry the frames apart.

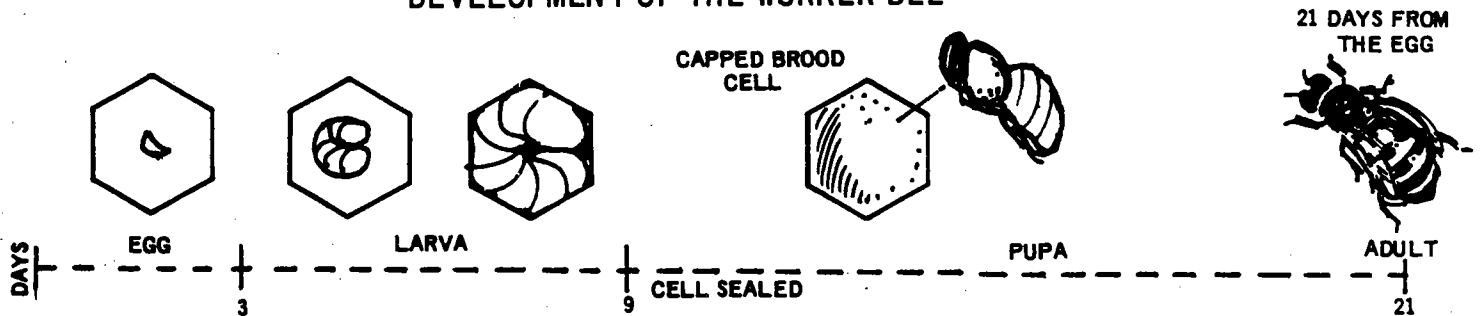


BEE DEVELOPMENT

Are you ready to examine a beehive? Stop! First, you should know why you're going to inspect the bees. If it's just curiosity, that's okay; but a beehive should never be approached without some goal in mind. Perhaps it's to see the queen. She's hard to find at times. The thing most beekeepers look at first is the brood.

Remember the brood is all the stages of young bees. Which individual is responsible for this brood? The brood begins with a single egg deposited by the queen in a cell. The eggs are very small and look like rice grains. They are so difficult to see an experienced beekeeper may have to show them to you. In three days the egg hatches into a white worm called a larva (the plural of larva is larvae). The larva is only there to do one thing -- eat! And eat it does. Worker bees feeding the larva (called nurses) may have to make thousands of separate visits to each larva over a six-day period so it can grow over 1,000 times its original size. That's the same as if a human baby were to develop to the size of a small elephant in the same period!

DEVELOPMENT OF THE WORKER BEE



After the sixth day, the larva finally stops eating. The cell is then sealed over by the workers with wax. A great change in form then occurs called metamorphosis. The white, soft-bodied worm in twelve days becomes a full-grown adult honey bee equipped with wings, a hard outer skeleton and sting. The brood stage during which this change occurs is called the pupal stage and the individual is the pupa (the plural of pupa is pupae). The adult worker bee emerges from its cell about twenty-one days from the time it was laid as an egg. Drones take some time longer to develop, twenty-four days, while queens have a shorter development, sixteen days.

Does all this seem complicated? It is, but to be a good beekeeper you must know the life cycle of the brood. Let's summarize it again: egg (3 days), larva (6 days), pupa (12 days) for a total of 21 days from egg to adult worker for honey bee. Remember, it's a little longer (24 days) for drones and a little shorter (16 days) for queens. That's really not so hard, come to think of it.

