

NATIVE BEES

by
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The name "bee" usually brings to mind the honeybee because that particular species has been domesticated for so many centuries and has become so widespread. Most people are familiar with bumblebees but they do not realize that there are many other kinds. Probably at least 15,000 different species of bees have been described for the entire world. About 300 have been recognized in North Dakota and there is little doubt that as many as 500 would be found if they were thoroughly studied. Most of these are small insects which might be confused with wasps, flies or other sorts. Aside from the bumblebees, some of the larger forms have quite a little resemblance to the honeybee. The name "sweat bee" is applied to some small bees and also to hover flies.

Bees and Their Relatives

The bees comprise one branch of the large order of *Hymenoptera*. The wasps make up another large group while the ants are in still another division of the same order. Yet another group includes parasitic forms which are still less known except for some of the larger and more conspicuous ones like the ichneumons. One of the chief differences between the bees and members of these other groups is that pollen is collected and used as food for the larvae. The hairs of the insect's body are finely branched and this makes it easy for pollen to adhere to them. Most of the bees are quite hairy but some are smooth. Even the smoothest ones have a few branched hairs.

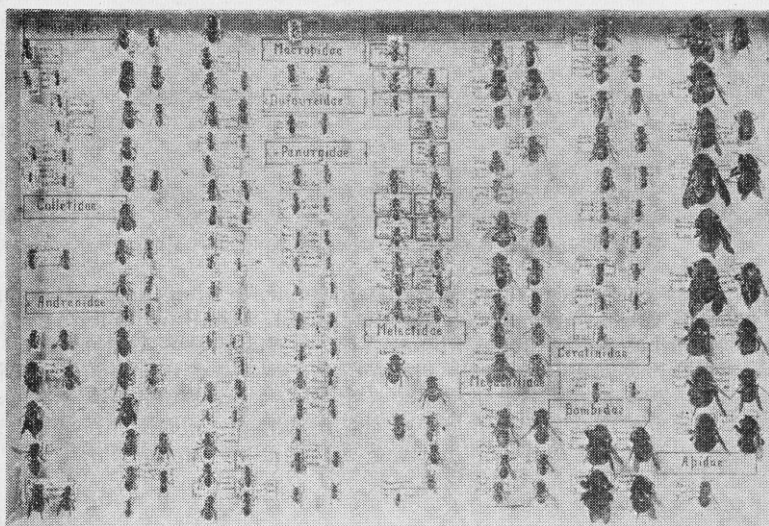


Fig. 1. A collection of native bees. Each pair includes female (left) and male (right). Honeybee at lower right.

Wasps, which are closely related to bees, visit flowers for nectar but this is usually used as food for the moment. There are a few kinds

which store honey as do many of the bees. Most of the wasps use other insects as food for the larvae. Most of the bees, as a matter of fact, do not store honey though they use the nectar freely as food for the time being and mix some of it with pollen. Mention should be made also of some of the flies which are common visitors of flowers. The hover flies are often mistaken for bees because they are bright colored, active visitors of flowers and frequently make sharp buzzing sounds. They actually eat the pollen as well as the nectar. Another large family of flies includes bee flies which are also common flower visitors, very quick in their movements and often very hairy.

Nesting Habits

Bumblebees, like honeybees, are social insects which live in large colonies. They have specialized castes of which queens lay eggs and workers carry on most of the regular work of the colony. None of the other wild bees found in this part of the country are truly social. A few of them form colonies where individual pairs have nests close together. Most of the bees are known as solitary because each female prepares a nest where eggs are laid upon small pellets of pollen. Nests are usually made in the ground or in hollow twigs.

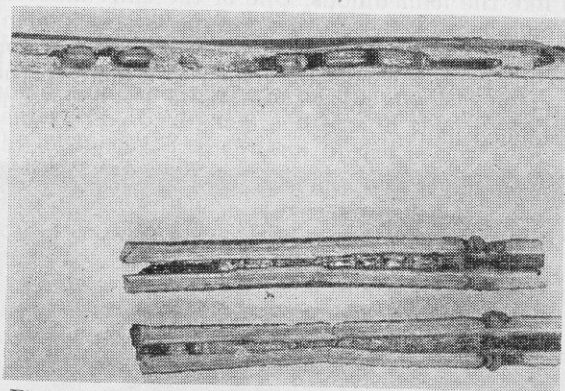


Fig. 2. Nests of native bees in twigs, showing pupae.

Each nest consists of about a dozen separate chambers which may be in a single row as sections of a main tunnel. A ball of pollen is placed in each chamber and an egg deposited on the pollen pellet. The egg hatches quickly and the early development of the larva is soon completed. Then it usually remains in the nest cell some time before it emerges as the adult insect. In the bumblebees the fertilized queens hibernate and begin a new nest the following spring. In some of the solitary bees the females hibernate in the adult stage.

Distinguishing Characters

One classification of the bees which was used for some time placed all kinds in two groups, the long-tongued and short-tongued bees. This did not prove to be a satisfactory arrangement and later classifications recognize several families. The mouth parts consist of several parts,

including the tongue proper, 2 pairs of slender jointed appendages called palpi and the jaws or mandibles. The tongue is hollow, but the other parts are placed together to form a rather large tube through which nectar can be taken up rapidly. The number of joints and the length of these in the palpi varies considerably in different groups and these form one group of characters used in the classification. Another set of characters is based on venation of wings. This also varies considerably and is more easily examined than other features. Structure of legs, head and other portions of the body provide still other characters.

In honeybees and bumblebees, the pollen is carried on the lower portion of the leg (tibia) and the enlarged basal joint of the foot. These two segments are hollowed out slightly and are broad with a fringe of hairs around the edge. This forms the so-called pollen basket into which is packed a mass of pollen moistened slightly with nectar to make a compact ball. Some of the other bees also collect such pellets of pollen but most of the wild bees simply pack dry pollen in among the hairs. The branching hairs on the leg form what is known as the pollen brush and the position of this on the leg as well as the details of the hairs varies greatly in different groups. Male bees do not collect pollen and their legs do not have these pollen brushes.

Another thing which should be mentioned is that a considerable number of bees have developed the habit of living at the expense of others. Like the cowbird among the birds, these parasitic bees do not make nests nor collect pollen. They merely deposit their eggs in the nests of other bees; the larvae feed upon pollen collected by the host bee and sometimes destroy the larvae of the host.

Our description of habits would be incomplete without reference to stinging. The sting is the ovipositor by which the female deposits eggs. As is well known, honeybees are unable to withdraw the sting, the abdomen is torn and the bee dies. This is not true of the other bees. Male bees have no ovipositors and cannot sting. With different kinds the severity of injury is more or less in proportion to the size of the insect. In tropical America there are numerous species of stingless bees *Trigona*, small insects related to the honeybee. The smallest known bees (1/12 in. long) belong to this group.

Bumblebees

We can conveniently discuss the bees belonging to several of the large groups as to their general appearance and behavior. Bumblebees are quite well known but distinctions between different species are not commonly recognized. There are about 20 different species in North Dakota. Some six or eight of these are quite common while the others are less common or are more restricted to certain sorts of places. There are some differences in size but the more obvious differences are in the pattern of distribution of the patches of black, yellow, or reddish hairs on the body. The general history of the bumblebees is as follows. The fertilized queen hibernates among dead grass, leaves or other rubbish. The latter part of April, in our region, they come out of hibernation and begin a nest in which eggs are laid a few at a time. The first brood to appear consists of quite small individuals which are very active little

workers. Later in the season somewhat larger workers appear so that there is more or less of a gradation in size from the smallest workers to the queens which are the largest individuals. The first males to develop are found in our region about the end of July. Late in the summer they are rather numerous and can be recognized by the more slender form and less active movements. They do not collect pollen but visit flowers freely to secure nectar for their own food.

The nests of bumblebees are often found in old mouse nests among grasses or weeds on the ground. Frequently they go into underground holes made by other animals or use various other cavities under sticks, rocks or other materials. After the first workers have emerged from their pupal cases, these old cases are used for storage of honey. As mentioned before, there are a few other bees which store a small amount of honey to be used by the larvae in their development but for the most part the other bees store only pollen and not honey. There are several kinds of bumblebees which are parasitic, that is, do not make their own nests but deposit eggs in the nests of other bumblebees. They differ in form from other bumblebees in that the pollen basket is not developed but the legs of the females are more rounded and covered with hairs as in the males. The females of these parasitic bumblebees are also less active than the hosts since they do not build nests nor store food material.

Leaf-Cutter Bees

The leaf-cutters (*Megachile*) are an especially interesting group comprising many species. Nearly 20 of these have been recognized in North Dakota and the group is one of the largest of all with several hundred species found all over the world. In fact the largest bee known is one of the leaf-cutters found in the East Indies and is slightly larger than the largest bumblebee. These insects are so named from the fact that the females cut out pieces of leaves to line the nests which are tunnels in hollow stems or other natural cavities. Plant leaves from which these leaves have been cut can be found quite easily. Two types of pieces are used, circular ones to make partitions between the nests and oblong ones to line the chamber. The French entomologist, Fabre,

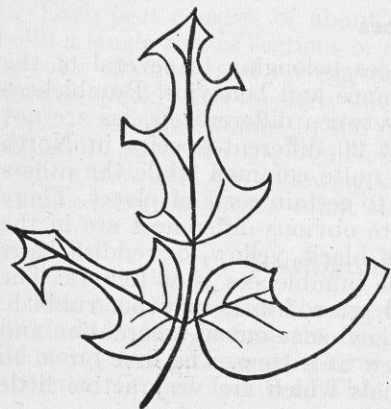


Fig. 3. Leaf of hog peanut showing where pieces were removed by leaf-cutter bee.

noticed that introduced plants in his garden were used by the leaf-cutters as well as native plants. He thought the texture of the leaf was the important point. However, I notice that they use quite a variety of leaves ranging from the very thin delicate ones of the hog peanut to the thick smooth ones of ash trees.

Our commonest leaf-cutter has a body as long as that of the honey-bee but much wider. It is known as *Megachile latimanus*, the specific meaning being "broad-handed", because the front feet of the male are much widened. These insects are thickly covered with brownish or grayish hairs and are common visitors of sunflowers, asters and many other kinds of flowers during late summer. The other species of leaf-cutters are mostly smaller in size but the flower habits are similar. These insects are among the regular visitors to flowers of alfalfa and sweet clover. Another feature of the leaf-cutters by which they are easily recognized is that the pollen is collected on the underside of the abdomen instead of on the legs. Fringes of stout hairs project somewhat backward and the flower heads of sunflowers, gumweeds, and other composites seem especially popular for pollen collecting.

There are several other genera of bees related to the leaf-cutters which collect pollen in the same manner but do not use leaf pieces in the nests. Some common, small, black ones nest in hollow twigs partitioning off the cells with a paste made from chewed plant materials. The Mason bees (*Osmia*), to which Fabre devoted most of one volume, are mostly bluish green in color. They are numerous in species and often nest in clay banks. Some of them build cemented chambers under stones or in various cavities, using a sort of cement made by mixing clay and saliva. Another related genus (*Anthidium*) has the abdomen marked with white or yellowish colored bands. Some of these use plant hairs to line their nests and others build cells of resinous material. Both these and the mason bees seem to show quite a strong preference for flowers of various legumes.

Other Bees

One common and interesting group of long-tongued bees is often known as long-horned bees (*Melissodes*) because the antennae of the males are about twice as long as those of the females. These are mostly somewhat smaller than honeybees, rather short, compact, and densely covered with hairs, usually gray or yellowish in color. The pollen collecting hairs on the legs are very well developed. These bees are found chiefly in late summer and are very active, visiting the flowers of thistle, sunflower and those of many other plants. Little is known of their nesting habits but they probably all make burrows in the ground. Most of these wild bees have no common names because the insects are so little known.

The term sand bee is frequently used for one very large group (*Andrena*) which nests in the ground. Of course, they often nest where the ground is not sandy and various other bees may nest in sandy ground. The species of *Andrena* are small to medium size, usually very hairy and often marked with distinct bands across the abdomen. This is one of the largest genera containing hundreds of species of which 50 or more

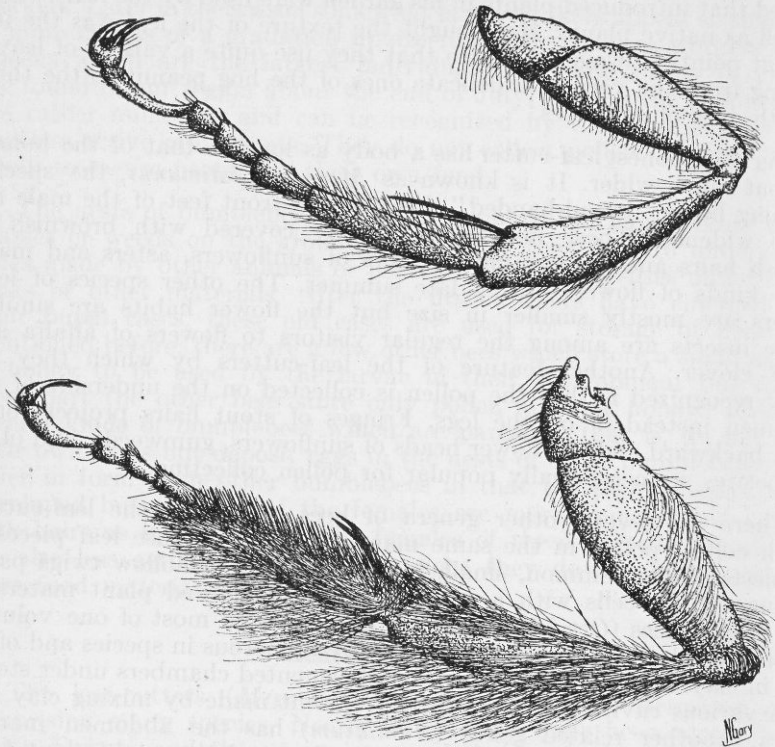


Fig. 4. Hind leg of a long-horned bee (*Melissodes*). Female (below) with well developed pollen brush; male (above) with no brush.

are found in North Dakota. These belong to the short-tongued bees. The tongue, in even larger species, is hardly half as long as that of the honeybee. They visit a great variety of flowers and are much more distinctly limited to certain seasons of the year than most of the other bees. Their nest habits are probably less well known than those of almost any other group.

Rather closely related to *Andrena* is *Halictus*, another large and very common group. These are sometimes known as furrow bees because of a groove on the middle of the last segment of the abdomen of the female in which the sting lies. The members of this genus are less hairy than those of *Andrena* and vary in size from medium to very small. Many of the small species are pale green in color. Their nests are made in the ground and are usually grouped in colonies. In these bees the females hibernate and no males appear until well into summer. Females continue to be seen until late in the fall and males are very numerous during late summer. Closely related to them and having the furrow character, are two small genera *Agapostemon* and *Augochlora* which are usually bright green in color. In some species of *Agapostemon* the thorax is black. The males are quite different in appearance having the abdomen marked with bands of black and yellow.

Some Small Bees

The length of the tongue is often not in proportion to the size of the insect. One rather striking group of bees which has not yet been found in North Dakota is known as carpenter bees. The common species is a large bee resembling a bumble bee. A somewhat related group is known as small Carpenter bees (*Ceratina*) and these are widely distributed and common. Our species is a rather smooth, blue-green insect, less than half an inch long. The females nest in hollow twigs and hibernate during winter. Late in the fall I have found them in hollow stems of raspberry where they had burrowed down to near the surface of the ground. The tongues of these bees are half as long as those of the honeybee though the bodies are much smaller proportionately.

There are many kinds of small bees which are ordinarily not recognized as bees. Among these are some which are common visitors to flowers of sunflower, gunweed and other composites late in summer. These include several species of *Panurginus* and *Perdita* which, like the honeybees, moisten the pollen to form a ball on their legs. The tongues of these bees are relatively long in proportion to the size of the body although not as long as those of the small carpenter bee. The face markings are interesting because the males usually have yellow spots or patches which form one of the characters which distinguish the different species. The species of *Panurginus* are black; those of *Perdita* are marked with light colored bands or are mostly light in color. Somewhat similar but not closely related, are very small, black bees (*Prosopis*) sometimes called masked bees because of the yellow face markings which are especially prominent in the males. These are very smooth bodied insects which do not collect pollen on their legs but actually swallow it. Their nests are made in hollow twigs. The tongue in this group is very short, broad and notched at the tip instead of slender and pointed as in most other groups.

Parasitic Bees

Some mention has already been made of parasitic bees. In one large group of these (*Nomada*), the body is almost without hairs and is usually colored with yellow and red. These are recorded as depositing eggs in the nests of *Andrena* but we know comparatively little about the detailed habits of the species. They are often called wasp bees because the coloration of the body is similar to that of many wasps. In another group (*Epeolus*), sometimes included under the same name, the body is usually black, marked with patches or bands of gray. At first sight, these markings appear to be in the body material but under microscopic examination the body is found to be closely covered with very small, scale-like hairs. The parasites often closely resemble their hosts.

Seasons of Bees

The different kinds of bees vary considerably in their season of flight and development as already indicated. The females of some species hibernate to come out early in the spring and thus may be found practically all through the summer. Many kinds do not appear until summer

has well begun and in some the time of flight is very short. Some kinds visit a great variety of flowers and others are restricted to particular sorts. One small black bee (*Macropis*) regularly visits the flowers of fringed loosestrife. It is rarely seen on any other kind. Another quite different species visits the flowers of bluebell. One is regularly found on false mallow and another on evening primroses.

In general there seem to be three periods when bees are found in abundance. During the last of April or first of May, the willow blossoms are visited by a large number of bees especially many species of *Andrena*. During mid-June, many kinds of flowers are in blossom and the kinds of bees found on them are largely different than those found on the willows. Early July seems to be a rather quiet period but again in August many species of asters, goldenrods and other composites bloom and these are visited by a great number of different kinds of bees. To a considerable extent the structure of the flower and the length of the insect's tongue determine what flowers will be visited. Flowers which have long slender tubes cannot be worked by short-tongued bees. Small flowers, especially those which are grouped in large clusters, are usually very popular with the insects. The late Charles Robertson of Illinois made a very exhaustive study of the flowers and insects of his locality. He recorded the largest numbers of visitors to flowers of some of the parsnip family and the next largest to some of the asters. Sweet clover, gumweed and goldenrod are visited by many kinds.

Importance of Bees

The economic relations of the wild bees may be summarized very briefly but the full details would require intensive study. Bumblebees have been recognized as important in pollination of red clover and many of the other bees are important for fruit trees. The case of alfalfa is complicated and still has not been worked out satisfactorily. Some species of leaf-cutters and other wild bees are common pollinators of alfalfa but the wild insects are not well adapted to care for the large areas of plants which are grown in fields. It seems that wild bees may be very effective in alfalfa pollination where small amounts of the crop grow near rough land which furnishes a better nesting ground for the insects. In ordinary fields, the number of plants is tremendously increased and the opportunity for nesting places is reduced. Many species of plants require cross pollination and bees are the most efficient insects in transferring pollen. Thus many plants are dependent upon bees for pollination.

“Factors Affecting Seasonal Milk Production and their Effect on Producers’ Costs and Returns” is the title of Regional Bulletin published cooperatively by the Agricultural Experiment Stations in the North Central and Northeastern States and the Bureau of Agricultural Economics of the United States Department of Agriculture. Although the North Dakota Agricultural Experiment Station did not cooperate in this study, it has secured a limited number of copies of the publication for distribution to interested parties upon application to the Information Department, State College Station, Fargo, North Dakota. The Bulletin is issued as Maine Agricultural Experiment Station Bulletin 459.