

A pair of Yellow-breasted Chats (*Icteria viridis* Bonap.) are breeding here the present season. Noticed another pair in Ludlow, Mass., about June 3d, which were probably also breeding. Have seen a specimen taken in Berkshire county, in the breeding season. Only straggling pairs of this species, however, reach Massachusetts.

The following species of Hawks, though extremely rare in winter, should probably be properly included in the above list of "Resident Species:" *Hypotriorchis columbarius* Gr., *Accipiter Cooperii* Bon., *A. fuscus* Bon., *Buteo lineatus* Jard., and *B. pennsylvanicus* Bon.

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#### V. Notes on the Habits of some species of Humble Bees.

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During the summer of 1862, while in Warwick, Mass., my attention was called to the Humble Bees by finding three nests of *Bombus fervidus* Fabr. and *B. vagans* Smith. These nests were formed of the deserted nests of mice, one under a barn in an old stump of a tree, the other two under piles of stones in a field. One of the nests of *B. fervidus* I kept in a box for some time, and watched the actions of the bees, but as I then neglected to make full notes, and as my first observations were confirmed by later ones, I allude to them here only to introduce an incident which has relation to the duration of life of the various kinds which always compose the communities of the Humble Bees. Upon leaving Warwick I left my valise, in which was a nest of bees, at the depot. Two months afterwards, in November, it was brought to me, when upon examining the nest several large queen bees were found in a lively condition, while the males, small females and workers were all dead. When the valise was left at the depot there was but one queen in the nest. This incident proves that the queens are not only late in leaving the cells, but that they are capable of enduring cold which is

fatal to the other bees. In the summer of 1863 while at Bridport, Vt., on the borders of Lake Champlain, I was so successful, in my entomological excursions, as to find as many as twenty-five or thirty colonies of bees, and to collect fifteen complete nests. These were of the following species: *Bombus fervidus* Fabr., *B. ternarius* Say, *B. separatus* Cresson and *B. virginicus* Fabr. As the general economy of these four species is the same, my observations may be considered as made upon one community, preceded however by the following special statements in regard to the several species.

**BOMBUS TERNARIUS.** Two nests collected: one under an old stump in a deserted mouse nest; the other, in September, under the clapboards of a house, about eight feet from the ground. Upon removing the boards, a large bunch of sheep's wool was found, evidently collected by rats, as there was a quantity of nut shells, with the under jaw and other bones of a rat among the wool. In the centre of the wool the bees had their cells. By etherizing the bees twenty-eight specimens were collected, which, as it was after dark, when the bees are generally at home, I have reason to believe were nearly all that belonged to the nest. There were thirty-five cells containing young, and thirty that were filled with honey, having their tops covered with wax. This is the only instance of my finding *the honey cells closed over*. There were also a number of bunches of pollen in which there were no eggs.

This species is not so common as *B. fervidus* and is far more savage in its disposition. I was informed by Mr. Brigham Rockwood, that he had noticed that this species never takes possession of the nests of mice (*Arvicola*) which are found so plentifully among the grass, but always chooses a place under cover of boards or stumps.

**BOMBUS FERVIDUS.** This is the most common species at Bridport, and is of quite a gentle disposition, allowing its nest to be disturbed for some time before it makes any show of resistance, merely exhibiting its uneasiness by buzzing. The communities of this species are found in old mice nests, both under stumps and boards; and also among the grass in the nests of the common field mice (*Arvicola riparia*). They also occupy the forsaken nests

of the house mice, as in one instance a colony was found under the flooring of a shed, in a nest made of bits of paper, rags, &c. This was the largest community collected, consisting of about seventy adult bees, one hundred and fifty cells containing young, and two hundred young larvæ, in various stages of growth, in the pollen masses, besides fifty cells filled with honey. This nest was found on the 23d of July. July 28th a nest was discovered in which there was a single queen bee and five or six large queen cells still soft and recently finished.

July 8th. Two queens were seen fighting upon the outside of a nest. So firmly were they united that they did not part until placed in alcohol, although pushed about for some time. They were both of the same species, but one might have been an invader, as I have found upon placing a strange queen, in a nest, that the rightful sovereign immediately commenced battle and in a short time expelled the intruder.

One community kept under glass on a window, with free ingress and egress, continued working, until, on a very hot day, the young became baked in their cells, by the heat of the sun. Then the old ones left and did not return.

Aug. 6th. A nest was brought home and the cells, containing young, placed apart from all old bees for the purpose of ascertaining if the young bee cuts its own way out of its cell. The cells were all of large size. In about half an hour a queen bee had come out and was seen walking over the other cells. She was immediately removed and the other cells were examined, but no signs of their having been cut could be seen. In the evening a slit was noticed in one of the cells and the young bee was seen at work cutting with its jaws. In a short time it made an opening in the cell large enough for it to push its head through. It then commenced cutting on each side, from the slit, above and below; now and then withdrawing its head and resting. Then it tried to force its way through the opening, but finding this was not large enough it cut a little more. The bee evidently did not wish to work more than was necessary, for it often tried to force its way out. At each attempt it made but a small enlarge-

ment of the orifice; but, after spending half an hour in alternate work and rest, it succeeded in freeing itself from its prison. Then it stood, for a short time, on the sides of the cell, moving its wings, after which it commenced walking over the other cells. This was a queen bee. Aug. 8th, another bee came out in the same way. Aug. 10th, two. Aug. 14th, one. Aug. 15th, another, which was the last in the cells. They were queens and all quite light colored when just from the cells.

These facts prove that the young cut their own way out of the cells. In another nest a young bee was seen to come from the cell while the old bees were present, which did not concern themselves about the matter further than to give a few passing glances and to cut off some jagged pieces of the cell. As soon however as the young bee was out of the cell, one or two old bees trimmed the edges of the cell and removed a few fragments from the inside.

**BOMBUS SEPARATUS.** Several colonies of this were found under old stumps and in other situations similar to those in which the nests of *B. fervidus* were found. This species is nearly as ferocious, on being disturbed, as *B. ternarius*.

**BOMBUS VIRGINICUS.** A single nest of this species was found under an old stump in an orchard. On the 27th of August three males were captured while flying under a large tree on which they frequently alighted. So much did these bees resemble large flies in their actions, that at first I mistook them for those insects. Male Humble Bees are often seen flying in this manner under trees. Are they not the drones which have left or been driven from the nest?

Let us now notice the life of a colony in its different stages. In the spring, the queen bee, having left her old home, may be seen roaming about in search of a new one, which she soon finds in some such place as previously described. She immediately collects a small amount of pollen mixed with honey, and in this deposits from seven to fourteen eggs, gradually adding to the pollen mass until the first brood is hatched. She does not wait, however, for one brood to be hatched before laying the eggs of

another, but, as soon as food enough has been collected, she lays the eggs for a second. The eggs are laid, in contact with each other, in one cavity of the mass of pollen, with a part of which they are slightly covered. They are very soon developed; in fact the lines are nowhere distinctly drawn, between the egg and the larva, the larva and pupa, and again between the latter and the imago; a perfect series, showing this gradual transformation of the young to the imago, can be found in almost every nest.

As soon as the larvæ are capable of motion and commence feeding they eat the pollen by which they are surrounded, and gradually separating, push their way in various directions. Eating as they move and increasing in size quite rapidly, they soon make large cavities in the pollen mass. When they have attained their full size they spin a silken wall about them, which is strengthened by the old bees covering it with a thin layer of wax, which soon becomes hard and tough, thus forming a cell. The larvæ now gradually attain the pupa stage and remain inactive until their full development. They then cut their way out and are ready to assume their duties as workers, small females, males or queens according to their individual formation.

It is apparent that the irregular disposition of the cells is due to their being constructed so peculiarly by the larvæ. After the first brood, composed of workers, has come forth, the queen bee devotes her time principally to her duties at home, the workers supplying the colony with honey and pollen. As the queen continues prolific, more workers are added and the nest is rapidly enlarged.

About the middle of summer, eggs are deposited which produce both small females and males, and it is supposed by some observers that it is from the union of these, at the last of the season, that the eggs are laid from which the queens are developed: but there seems some reason to doubt this, as a new nest, previously mentioned, was found on the last of July occupied only by a queen and queen larvæ. It is true, however, that all eggs, laid after the last of July, produce the large females, or queens, and, the males being still in the nest, it is presumed that the queens are impregnated at this time, as, on the approach



of cold weather all, except the queens, of which there are several in each nest, die.

The efforts of my friend Mr. Rockwood to procure nests for me during the winter have as yet been unsuccessful, those which he had marked for removal having been destroyed by mice.

It is desirable to ascertain whether the queens remain torpid during cold weather and what use is made of the pollen and honey stored during the last of summer and in the fall, which perhaps is food for the queens during the mild weather in spring before plants are in blossom.

But little wax is made by the Humble Bees, as it is only used for covering the cocoons of the larvæ, for thinly lining the nest on the inside, strengthening the old cells which are used for honey pots, and occasionally covering these pots, and propping up the old cells.

During some years Humble Bees are very numerous. This is generally the case when a dry and early spring is followed by a summer producing a good crop of clover. After such a season, if the following spring be favorable, nests are very abundant.

Though very similar to those made by Reaumer, over a hundred years ago, it will be noticed that my observations differ, in several particulars, from those made by some European naturalists who have written on the *Bombi*.

Some observers have stated that the eggs of the Humble Bee are deposited in cells, partly filled with pollen, which are enlarged by the workers as the young increase in size, and that the old bees, cutting holes in the cells, feed the young until they are fully developed when they relieve them from their prisons. This is quite contrary to the results of my observations in New England.

At present I cannot believe that the peculiarity of food, or the structure of the cells, produces a difference of development in Humble Bees, for the larvæ, as has been previously stated, were seen to make their own cells from the pollen paste, while the old bees were quite indiscriminate in selecting the plants from which they procured both pollen and honey.

Is it not more natural to believe, as has been suggested to me by Professor Wyman, that the difference in the de-

velopment of the eggs is owing to their being laid at various times after impregnation? Thus, if I am right in supposing that the queens are impregnated by the males late in the summer, the eggs laid soon after produce the large queen larvæ: the next set of eggs, laid in the spring, produce the workers, or undeveloped females, while from those deposited still later, male bees are principally developed.

This opinion seems to be corroborated by the state of the nest, previously noticed, found on the 28th of July, which had been recently commenced and contained only *queen* cells, the parent queen being obliged, by her recent impregnation, to lay only such eggs as were adapted to the season. As no first brood of workers, or second one of males and small females, had existed in this nest, the eggs producing the queen larvæ must have been laid by the large female or queen, found in the nest, and not by a small female.

The fact, that our species of Humble Bees take possession of the nest of mice and rats, accounts for the large number of *mites* found in most nests.

Three parasites are common in the nests of our New England Humble Bees. They are, a small beetle of the genus *Byturus* only known thus far in the imago state; a moth of the genus *Nephopteryx*: the larvæ of which is quite abundant in most nests, and a dipterous insect which is often found in the larval state.

It is singular that in all the nests, which I collected, not a single specimen of *Apathus* was found by Mr. Packard, though this parasitic bee is generally supposed to be quite common in the nests of *Bombus*.

*Additional Notes, August 3, 1864.* A nest of *Bombus pennsylvanicus* was found at Upton, Me., on the sixth of last June, in which there was but a single queen bee with seven cells of the smallest size, containing larvæ, and several eggs in a mass of pollen.

A queen of *B. pennsylvanicus* was taken, on July 20th, under leaves in a wood.

Professor A. E. Verrill found a queen Humble Bee in a torpid state under leaves, before the snow was off the ground in the spring of 1863.