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OBSERVATIONS ON THE HABITS OF *SPHEX PROCERA* IN MANITOBA

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AS INTERESTING objects for study the Hymenoptera probably rank above all other insect orders, and owing to the diversity of their habits they perhaps excel even some of the higher groups of animals such as birds. Much has been written concerning them, but vastly more remains to be told. Indeed their activities are all around us and their influences upon our daily life are manifested in innumerable ways.

It is not my intention here, however, to enlarge upon so general a subject, when there are already so many works available for reference. The writings of Henri Fabre, the Peckhams and, the Rauses in particular provide numerous fascinating studies. I propose instead to present a short paper on the life-history of *Sphex procera* Dahl. in Manitoba. This wasp has already been studied in Texas by Carl Hartman and to a lesser extent by the Rauses, but there are gaps in its biography still to be filled and it is hoped that this paper will shed light upon them.

For the benefit of those not acquainted with *Sphex procera*, I may state that the insect is a large blackish wasp, very wiry in appearance and in shape long and slender, with an elongate thread-like waist which even the extremists in fashion could hardly imitate. This wasp is also long-legged and, when in company with others, often indulges in a dance-like motion produced by the combined action of legs and wings together. It rejoices in the hot sunshine and is partial to sandy situations.

On September 12, 1916, being in need of relaxation after some wearisome laboratory occupation, I set forth into the wilds in search of adventure. It was necessary for me to pass through a garden in my wanderings, and on the threshold I was brought to a stop by the following incident which eventually led to the writing of this paper. There at my feet a large wiry digger-wasp was busy in the not unfamiliar occupation of dragging a caterpillar many times her own size along the ground. The larva, to all appearances, was stiff and lifeless, and the wasp, grasping it behind the head partly carried and partly dragged it upon its back towards her lair. Exactly where the kill had taken place or what the distance covered by the hunter

with her game cannot be definitely stated but as the nearest food plant of the caterpillar, a cherry tree, was more than a hundred feet away it may be safely assumed that the final hunting scene had taken place at least that distance away from the home of the wasp. When I first met the *Sphex* with her prey, which proved to be a larva of *Smerinthus geminatus*, she had still fifty feet to travel to her nest, but in spite of various obstacles in her path, such as a rhubarb plant, she moved steadily onward towards her goal without hesitating in her direction and without once relaxing the hold upon her victim.

The *Sphex* moved directly towards her burrow, which she had already prepared for the reception of such game as this. In due course she arrived at her destination, but only to find another of her species in possession. The latter immediately darted at her, and the ensuing fight terminated in the hasty retreat of the intruder. The rightful owner of the caterpillar at once returned to her quarry and, after dragging it a little nearer to some holes clearly visible in the ground, left it nearby whilst she surveyed her surroundings, apparently having some doubt as to the exact situation of her lair. Becoming satisfied she grasped the larva and, straddling it in the customary manner, she made a circle with it around the entrance to her burrow. Then placing her burden near the entrance she entered the burrow, returning soon afterwards with a small stone. This operation was repeated until seven stones had been brought to the surface. Then followed various unsuccessful efforts to place the caterpillar in position for insertion into the burrow. This was at length accomplished by placing the larva in such a position that its head was as near as possible to the entrance. The wasp then entered the burrow backwards, dragging the caterpillar after her.

The horn-like tail of the larva had hardly vanished down the hole when the second wasp, already referred to, again appeared upon the scene. Looking eagerly about, as if to make sure that her rival was absent, she advanced towards the hole and ventured down it. On encountering the tail end of the caterpillar she at once rushed out in great excitement and, grabbing a stone, she hastily

dropped it into the hole and as quickly followed it with others. Soon all the available stones were blocking the entrance and then to complete the operation she speedily kicked sand over them. These wasps are impish at the best of times, but this one seemed particularly so as she strove to bury her sister alive. As I was speculating on the outcome the buried *Sphex* forced her way to the surface, rage being depicted in her every movement. The invader for a moment remained motionless with astonishment, and then literally took to her wings and fled with the owner of the burrow in hot pursuit. The chase, however, was of short duration and number one was soon again busy at work with her buried caterpillar.

It may have been the second wasp that had actually opened the burrow in the first place in preparation for using it herself. Whether the second wasp really knew, when she so hastily piled stones over the caterpillar, that she was also actually burying her rival can only be speculated upon. Her haste might lead one to believe this to be so, but I do not think it really was. It is probable that she was more concerned in using the larva later on for her own progeny. We will, however, avoid speculation and return to our first *Sphex*.

After chasing the intruder away she spent the next few minutes in again removing the stones and sand from the entrance of the burrow, carrying them in her jaws and placing them a few inches away. Having thus completed the excavation to her satisfaction she returned each stone to its position in the hole, making a low buzzing sound as she did so. Her manner in performing this work was very different from that of the second wasp; it was not merely a case of dropping the stones into the hole, but each was moved back and forth and steadily pressed into place in order to make it fit closely, the sand being used to fill up the spaces between. Nineteen stones were gathered in all, each slightly less than a quarter of an inch in width and irregular in shape, and arranged in this manner. Larger stones were tested but the difficulty in holding them with her jaws usually obliged the wasp to discard them. After the stones were in place they were covered with earth, the latter being kicked into place with the front legs after having first been loosened by means of the jaws, the whole operation being always accompanied by that half-angry buzz as if the wasp were taking vengeance on the soil because of its hardness.

The care with which the *Sphex* filled her burrow was equalled only by the thorough way in which she hid all traces of it. She not only obliterated all signs of the hole itself, but she also dug up the earth fully four inches in every direction from the

entrance of the burrow, so that it became quite impossible to distinguish the original hole. The wasp inspected her work many times and smoothed over or dug the soil a little more wherever it seemed necessary, but she did not, as others have reported, use either stick, leaf or moss to assist in hiding the hole. The whole operation described as I observed it took an hour and forty-three minutes, not including, of course, the original digging of the burrow or the caterpillar hunting.

Several other *Sphex* wasps of the same species were present in the vicinity, all busily working or dancing if there was nothing more important to do. When any of them drew near to our worker they were easily driven off, as if they realized that they were trespassing. Ants, too, frequently came near but although the wasp evidently had some fear of them the safety of her offspring overcame all other considerations, and, as the easiest means of ensuring safety, she took the ants by the middle and dropped them at some distance away. In most cases the ants seemed little the worse for this drastic treatment. Occasionally they were seen to be in a dazed condition showing that they had suffered somewhat in the process of removal.

On one occasion a large, hairy caterpillar blundered into the hole while the *Sphex* was digging and I really looked for something interesting as a result, but the wasp, after mistaking the caterpillar's head for a stone, showed no further interest other than a decided aversion to coming into contact with its bristly hairs.

On the following day I again visited the *Sphex*'s home. Soon after my arrival she appeared upon the scene and at once commenced to undo the work of yesterday by digging out the burrow. The disguised entrance so elaborately arranged on the previous day in no way misled her as to the exact location of the burrow, and, digging directly in, she removed the carefully placed stones and within a comparatively short time dragged forth the caterpillar. After examining it she seized it behind the head and, despite its inertness, thrust her sting twice into its thoracic segments. Having performed this operation she once more set to work to clean out the burrow. Taking advantage of her disappearance below ground, I removed the caterpillar and examined it carefully for signs of an egg but none was to be seen. I then placed it on the ground some distance away from the burrow and awaited results. The wasp continued to dig unconcernedly for some time and when ready for the caterpillar turned to secure it. She seemed considerably surprised at its absence and immediately commenced to circle around the burrow, increasing her distance from it with each revolution. In this way she soon discovered her

prey, which she then dragged back to the burrow. This was followed by a little more digging and the larva was once more buried out of sight. The wasp remained below with it for about three minutes while ovipositing and then returned to the surface. The work of filling in the hole was performed in the same careful way as before, twenty-three stones being used this time, some of which I had placed conveniently near. The *Sphex* then covered the stones with soil, packing it with her head and, having hidden all traces of her work by digging up the surrounding ground, departed from the spot.

The habit of burying a caterpillar one day with out depositing an egg, and of exhuming it the day following for that purpose, has not, to my knowledge, been previously observed, although Hartman reports digging up two caterpillars without eggs upon them. This habit needs to be verified, however, in view of the difficulty of identifying individual wasps. Judging from the habits of wasps of other genera this practice is not an unusual one, and it might indeed be suspected from the fact that burrows are often prepared several days before they are used.

I visited the spot on the following day and found a wasp, perhaps the same one, still present. She kicked the soil about from time to time and drove away intruders but made no effort to dig up the caterpillar. Several other females were at work close by. I saw three digging holes, two removing the soil by flying with it in their jaws, and the third by running with it, as in the case of the individual mentioned in my first notes. Each filled the opening with a few stones and concealed the entrance with material of such a condition and color that it merged into its surroundings perfectly so that no one would suspect the presence of a burrow in the neighborhood.

It was on the third afternoon that I witnessed another strange habit of these creatures. A smooth-skinned caterpillar had unwarily crawled onto the sand near to a burrowing *Sphex*, and eventually fell into the hole in which she was working. The wasp showed considerable astonishment at first, the astonishment giving place to anger followed by satisfaction at having so easily secured fresh meat for her larder. After a violent struggle she dragged the larva forth, and grabbing it behind the head lifted it onto its feet and twice inserted her powerful sting between its forelegs, and after altering her position slightly, again further back. This speedily had its effect and in a few moments the caterpillar became paralyzed, to remain fresh but incapable of escaping until

the larva of the wasp should be ready to feed upon it. A wonderful provision this for keeping meat fresh in hot weather and how simple in comparison with our elaborate systems of cold storage.

Having prepared her victim in the manner described, the *Sphex* ran with it twice around the entrance to her burrow, then, placing it nearby, she continued her digging. Much to my surprise she ultimately dragged from her burrow a large Sphingid caterpillar that had unquestionably been buried for some time, followed by a shiny white larva which was evidently one of her own kind that had been feeding upon the caterpillar. This last was placed among the stones. As she proceeded with her work it soon became evident that the wasp was considerably mystified by the presence of two caterpillars. First she would drag one a little way, and then the other. The Sphingid, too, had commenced to decay, and its juices proved far from pleasant to her. It was indeed quite amusing to watch her after handling this larva, rubbing her head in the sand and cleansing her antennae as if attempting to free them from the putrified matter. This cleansing process was repeated whenever she handled the caterpillar and she rested several times as if overcome from the effects.

In due course she modelled the burrow to her satisfaction and had the freshly killed larva in place and the Sphingid partly down. I believe the attempt to place both of the larvae in the burrow was due to the wasp's inability to distinguish between them or failure actually to recognize that there were two. The wasp had finished her work of cleaning out the surplus earth and had begun to lay the stones before she became aware that the Sphingid caterpillar was not in place. After hesitating for some time she ultimately dragged it from the burrow, carried it some distance away and abandoned it. The final task of filling in the hole was then resumed. Twice she flew away to rest, but, finally completing her work, she hid the burrow entrance by digging up the surrounding earth, and departed to return no more that afternoon.

The Sphingid caterpillar was left on the surface of the ground to be devoured by ants and the wasp larva for whom it was intended as food remained on the surface of the soil to die of hunger and exposure. One might ask whether this wasp was the mother of the larva thus left to perish or only an intruder into the nest of another, and finally, what would she have done had the second caterpillar not fallen upon her? These are questions for future investigators to solve. To me they remain a mystery.



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