ON THE EARLY STAGES OF SAMIA COLUMBIA SMITH.

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On the night of the 7th of last June my wife captured at light a fine female *Samia columbia*. The moth was at once secured, her wings pinioned, and she was placed in a cage with the hope that specimens of the other sex might be attracted, but none made their appearance; and on the night of the 12th she laid five eggs, glueing them to the gauze on the side of the cage, two in one place and three in another. During the following day (13th) none were laid, but on the night of the 13th she laid fourteen more in several different clusters, and on the night of the 14th she laid six more. None were laid during the following day and night, and as she was injuring herself with the pinion, she was killed and spread. Whether she would have laid any more had she been kept longer, or whether she had laid any before her capture, I cannot say.

On the morning of the 26th one of the eggs hatched. I then began to look about for their food plant. Smith states, Proc. Boston Society of Natural History, vol. ix. p. 344. as follows: "They [the cocoons] were mostly attached to *Nemopanthes canadensis* and *Rhodora canadensis*; a few were found upon *Kalmia angustifolia* and maple, and one upon the larch. The larvæ undoubtedly feed upon the first two plants, and perhaps upon the others; but the cocoons were always where the larvæ might have fed upon the *Nemopanthes* or *Rhodora*."

Dr. Packard, in his Synopsis of the Bombycidae, Proc. Ent. Soc. Phil., vol. iii., p. 380, says: "It (*S. columbia*) feeds upon *Rhodora canadensis*, spinning its large cocoons upon the terminal twigs of that shrub."

Guided by these statements, and remembering that *Nemopanthes canadensis* does not occur in this region to my knowledge, I first collected *Rhodora canadensis*, and gave them, but they never so much as tasted it, though I kept a few on it till they were nearly starved. I cut the edge of the leaf so they might have easy access to the soft juicy parts of the interior, but all to no purpose. I tried them on *Kalmia angustifolia*, *Amelanchier canadensis*, maple, beech, white birch, ash, apple, pear, willow, ilex, gooseberry, currant and larch. They just tasted of the last four, but would not feed upon them. I should say that the trial on larch was not

satisfactory, as I put one on it and kept it there less than half an hour. Finally I put them on elm, upon which they fed a little, but died one after another.

My friend, Mr. Charles Fish, had been fortunate enough to secure a female which laid twenty-five eggs, I think, and with the young hatched from these he was having a similar experience to my own. He finally succeeded in getting the remaining few of his to eat wild red cherry (*Prunus pennsylvanicus*). I was obliged to leave home at this time, and got my friend, Mr. Anson Allen, to take the care of my young *columbias* in my absence. Learning of Mr. Fish's success with wild cherry, he put a part of the remaining number on that plant, leaving a few on elm, all of which died, while those fed on the wild cherry succeeded in passing the first moult, and I have been able to carry three through and see them spin up their cocoons successfully. About the time these were in their later moults Mr. Allen found two *columbia* larvæ feeding on larch (*Larix americana*), so remote from other trees that there could be no possibility of their having crawled on to it from any other tree, and further, these same larvæ continued feeding on the larch in confinement for several days and then spun their cocoons. Mr. Fish also found one or two larvæ feeding on the larch, several miles from where Mr. Allen's were found. These were all in a very healthy condition, and, it is hoped, will yield good imagines next year.

I have observed this striking peculiarity in the habits of the larva of *columbia*, that from the time they hatch till they are done feeding they never wander about, but remain upon a leaf or twig entirely unsuitable for food till they starve, even though there be fresh food within half an inch of them.

When they are fully grown and are done feeding, they evacuate their bodies and then begin to travel around their enclosure, continuing their travels sometimes for twenty-four hours, till they find a suitable place in which to spin their cocoons. At first they spin a certain amount of white or silver-colored silk, and after that has been expended, the brown silk. One of the larvæ wandered about for a long time before it appeared to get ready, or to find a suitable place in which to spin its cocoon, and all this time it was wasting its silvery silk, spinning it freely as it crawled slowly over the surface of the glass forming one side of the breeding cage. At last a satisfactory place was found, and the cocoon spun, but almost entirely without the characteristic silvery bunches upon

the outside, for the simple reason, as it would seem, that the larva had no white silk remaining to give the appearance usually seen upon the outside. I further observed that those which spun up immediately, without wandering about much, make cocoons with the most complete silvery bunches upon them. After the first long threads of the cocoons have been extended, the larva moves its mouth back and forth for a considerable length of time in one place, as far as it can move its head, thus depositing a large amount of the silvery silk in this place; then moving to another place, the same operation is performed, and so on over the whole *exposed* parts of the cocoon. I did not see that they deposited any of the silk in this way against the under surface of the glass when the cocoon was placed against it. Nearly all of the cocoons which have been found here were on the larch, and these silvery bunches certainly give them a very close resemblance to the bark of that tree.

Egg.—Sub-globose, slightly compressed, the compression being least upon the side from which the young escapes; cream-colored, clouded with reddish-brown, and attached to the object upon which the female deposits by means of a dark brown adhesive substance, which appears to be the same as that which is clouded over the surface of the egg, but the greater abundance of it at the point of attachment produces a much darker color. Greatest diameter, 2 mil.; medium, $1 \frac{4}{5}$ mil.; least diameter, $1 \frac{2}{5}$ mil. The eggs hatched in fourteen and fifteen days after they were deposited.

Young Larva.—Length immediately after escaping from the egg shell, 4 mil. Color black; some of the individuals show a greenish tinge around the base of the tubercles. Body cylindrical, slightly tapering towards the posterior extremity; head large, rounded, sparsely clothed with long hairs. The second (first after the head), third, fourth, fifth, and sixth segments each with eight tubercles, the lowest one on each side much smaller than the others. The seventh, eighth, ninth, tenth and eleventh segments have each six tubercles, rather smaller than the corresponding ones on the preceding segments. The twelfth segment has five tubercles, two on each side corresponding with those on the preceding segment in size, and one on the middle of the dorsum of the same size as the upper ones on the third segment. The thirteenth segment has four tubercles on the anterior edge and one at the base of each anal proleg. The tubercles are smooth, cylindrical, gradually enlarging towards the base and at the summit, the least diameter being about two-thirds the way up; length equal to about three times the least diameter, surmounted with

from two (on the smallest) to six finely serrated, radiating bristles which are about twice the length of the tubercles. Duration of this stage eight to nine days.

After the First Moul—Length (taken a short time before the second moult), 15 mil. Color pea green. Tubercles and bristles, mandibles, palpi and antennæ, a spot about the eyes, a stripe on each side of the clypeus, the legs and a spot on the outside of the prolegs, black. Second, third and fourth segments each with four black spots on the posterior edge and a row of black spots on each segment after the head, on the line of and behind the stigmata. Duration of this stage five to seven days.

After the Second Moul—Length (taken soon after the second moult) 20 mil. Color pea green with a bluish tint upon the dorsum. Black markings as in preceding stage. Duration of this stage four to five days.

After the Third Moul—Length 35 mil. Color pea green, lighter on the dorsum. Marked with black as in the two preceding stages. All the tubercles with the basal portions blue, except those on the second segment and the lower one on each side of the third to the sixth segments inclusive. Duration of this stage six to nine days.

After the Fourth Moul—Length 50 mil. The head at the time the larva escaped from the egg-shell was proportionally large, but during the succeeding stages it did not grow so fast as the other parts of the larva, and at the beginning of this stage, but more especially at its close, it was proportionally small. Duration of this stage ten to twelve days.

Mature Larva—Length 76 mil. — about three inches. Thickness between the segments 13 mil., of largest part of segment 15 mil.

Head pea green, sparsely clothed with fine yellowish hairs. Mandibles, outer joints of antennæ and palpi, spot about the eyes, two spots on the gular (these may have occurred in the previous stages, but were not observed), and a stripe on each side of the clypeus, black, the latter sometimes wanting. Basal joints of antennæ and palpi and the labrum greenish blue. General color of the body pea green, rather lighter than the head, and lighter above than on the sides, with the faintest tinge of blue between the segments. Last joint of the legs and claw black. Stigmata oval, white, surrounded by a fine black line.

The tubercles were greatly changed at the fourth moult, both in form and color. The first and lowest on the second segment is small, conical, black and surmounted by a few short, stout, black spines. The second is

more rounded at the top, shining black at the base, and resembling white glazed porcelain at the apex, with four black spines. The next two are smaller, about $2\frac{1}{2}$ mil. apart on the front edge of the segment, the lower of which is about 5 mil. from No. 2. These are very small and black, the upper one having a trace of greenish-white at the apex, and both are surmounted with several short black spines. The lowest tubercles on segments three to six inclusive are small with black bases, apices resembling white glazed porcelain, and generally two black spines. The tubercles of the next row above, extending from the third to the last segments inclusive, are very similar in form and color, but larger; those of the row above this are slightly pear-shaped, a very little thickened towards the outer end, of the same color as the preceding, and surmounted with from four to six short stout black spines. Those of the next row on the third, fourth and fifth segments, and the corresponding ones on the opposite side of the dorsum—by far the largest on the larva—are pear-shaped, largest outwardly, porcelain white at the base, with a band of shining black above, and a bright coral-red top, with from six to eight stout black spines. The tubercles of this row on the sixth to the eleventh segments inclusive are nearly as tall, but slimmer than those preceding, slightly curving backwards, porcelain white at the base, a very light straw color above and armed with two black spines at the top. The dorsal tubercle of the twelfth segment is very similar, but larger, and armed with several black spines. The tubercle at the base of the anal proleg is smaller than those before it, of a light bluish color, with black at the base outside.

The most striking differences observed between *P. columbia* and *P.*

cecropia, in a brood of the latter raised by the side of the former, are—first, the smaller size of *columbia* at each of the stages; the mature larva of *columbia* is about three inches in length, that of *cecropia* about four. Secondly, *columbia* is of a clear light pea green color, *cecropia* a dull bluish green, giving a much darker aspect to this larva. This distinction of color is so marked that if once observed, the one can never be mistaken for the other. Thirdly, *columbia* has three pairs of coral-red tubercles, one pair each on the third, fourth and fifth segments; *cecropia* has two pairs, one pair each on the third and fourth segments. Then the color of these differ; those of *columbia* are a true coral or vermilion-red, while all the *cecropias* I have seen have these tubercles a color somewhat approximating that of resin. The remaining dorsal pairs of tubercles to the twelfth segment, and the central one on the twelfth, are lemon yellow, while in

columbia they are white at base and a very light straw color above. The remaining tubercles of *cecropia* are black at the base and blue above; in *columbia* they are black at the base, but with the look of white glazed porcelain above. These distinctive characters showed no tendency to run into each other in any of the examples I have seen. As perhaps having a bearing upon the question whether *columbia* is a hybrid between *cecropia* and *promethea*, I will say that in six years of careful collecting at this place I have never taken a *promethea*, nor has one ever been taken here to my knowledge; yet the empty cocoons of *columbia* have occasionally been found, mostly in larch trees, in one instance about forty feet from the ground.

I am therefore convinced that *columbia* is a good species, but whether distinct from *Gloveri* I am not prepared to express an opinion.

In my observations on *columbia* I have been greatly assisted by Messrs. Allen and Fish, who rendered every possible aid and placed their notes at my entire disposal.

ON FOOD PLANTS OF PAPILIO CRESPHONTES (THOAS).

BY THE EDITOR.

In September last we were much gratified, although somewhat surprised, at receiving a number of the larvæ of this beautiful butterfly from Mr. S. Eccles, of St. Thomas, Ontario, a town situated about 17 miles south of London, and about half way between it and Lake Erie. They were found in Mr. Eccles' garden, feeding on *Dictamnus fraxinella*, a perennial herb which is a native of Southern Europe, but cultivated in this country for ornament in gardens. The larvæ were in different stages of growth, from one to two inches in length, and were feeding greedily on the plant referred to. We had never seen this larva before, but its markings are so peculiar that we recognized it at once from recollection of the figure given in Boisduval & LeConte, pl. 13. As this description may not