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CONTROLLING SEX IN BUTTERFLIES.

BY MRS. MARY TREAT.

THAT sex can be controlled in butterflies, I think I have demonstrated by careful experiment the past season. Accident first prompted the experiment. Two years ago this past summer, I was feeding a few larvæ of *Papilio Asterias* for the cabinet, when one of my specimens wandered from its food, and rested upon a book to undergo its transformations. Not feeling inclined to give up the book to this purpose, I placed the larva on a fresh stem of caraway; upon removing it from the book, I found its feet were entangled in silk, and that it was in position for a chrysalis, but not yet fastened; so I was surprised to see it commence eating. It continued eating some days longer, before changing to a chrysalis. I then tried others in the same way, and also took off quite a number of larvæ, shutting them away from food. Some of the larvæ that I deprived of food in this first experiment died, but all that completed their transformations were males; while those that I induced to go on feeding by tempting them with the best and freshest food proved to be females.

This season (1872) I commenced with the larvæ the 17th of June, and continued feeding broods of different ages through the month of July. Early in July I had about two hundred larvæ feeding at the same time. The room in which I conducted my experiment faced east and south, and toward noon of each of those excessively hot days in the early part of July, it was several degrees warmer than in the outside air. The food-plant on which I fed the various broods was placed in jars of water, which were

set in a large box partly filled with earth, the whole being covered with deep blue mosquito-netting. Heat and moisture seemed favorable to health and rapid growth.

On the 25th of June one lot of eggs hatched, on the 10th of July they were chrysalides, and on the 18th of the same month the butterflies appeared, only requiring twenty-three days for the complete transformation. On the other hand, I have had this same Asterias butterfly eleven months in coming to maturity; some larvæ that hatched in August, 1871, I fed eight weeks, but the nights were cool and some days were absolutely cold, when the larvæ would not eat. These chrysalides I preserved during the winter, and early in June, 1872, I put them in this same warm room in which the larvæ grew so rapidly, and they were in this room some two weeks before the first larvæ of this season were hatched; and strange as it may appear, some half dozen butterflies of this year's brood came out before these last year's chrysalides produced butterflies.

Very soon after the last moult, I shut a number of the larvæ away from food, putting them in paper boxes, from five to ten in a box, carefully labelled. If, at the end of two or three days, the larvæ were still wandering about, I fed them sparingly; in this way I did not lose a single specimen in the larva state by shutting away from food; a few of the chrysalides died.

It was with the most intense interest that I watched the coming forth of the butterflies, which began to appear in about eight days after assuming the chrysalis stage. Thirty-four males came from my male boxes, and then a rather small female made its appearance. Out of seventy-nine specimens that I labelled males, three females were produced. On the other hand, those that I fed up, keeping them on a good supply of fresh food, I labelled females, and placed them in separate boxes. Out of these boxes sixty-eight females came and four males.

There were some boxes that I marked doubtful, which I do not include in the above figures. For instance, I took five larvæ that were eating vigorously; if let alone they probably would have eaten a day or two longer, but I wished to try them in all stages of growth, and these were of quite a large size; out of these five, four were females.

Soon after the last moult, I took twenty larvæ and shut them away from food for twenty-four hours. At the end of that time I

replaced ten on a good supply of food, watched them carefully, and kept them eating until they attained a large size; they became chrysalides within a few hours of each other, and emerged as butterflies eight days after. One of these chrysalides was accidentally crushed; the remaining nine were females. Of the starved ones, eight males came out; the remaining two chrysalides died.

The butterflies, as fast as they made appearance, were killed and pinned up, the males arranged on one side, the females on the other—a most brilliant display, covering a much larger space than one would be apt to imagine.

It would seem, then, as the result of the whole experiment, that sex is not determined in the egg of insects, and that the female requires more nourishment than the male. Nor does this appear strange, when we consider the reproductive nature of the female. It has frequently been said to me, "if your theory is true, it makes the female higher in the scale—superior to the male." I believe it has always been admitted that the female gives birth to the young. If this is considered superiority, then the female is superior; but if beauty of form and color is taken into account, then the male insect is superior, the same as with birds and the higher animals. Carry the analogy further—up to human beings—and still we find the principle holds good. To which sex belong all our great inventors, statesmen and philosophers? I believe woman is physically incapable, other things being equal, of becoming as profound a philosopher, as deep a thinker, as man. I do not wish it understood that I deem woman inferior to man; there is no inferiority, no superiority. If this matter were better appreciated, we should hear less of "woman's rights," and equality of the sexes, and woman would quietly take her place by the side of her brother, with no contention for rights.

But to return to some corroborations. Toward the last of May, some twenty half-grown larvæ of *Vanessa Antiopa* were brought to me. I placed the branch on which they were feeding in a jar of water, turning a wooden box over them, and thought no more of them for over a week, when I uncovered them and found the branch had fallen from the jar, and the leaves were so dry I could powder them in my hand. More than half of the larvæ were dead; eight poor, starved-looking specimens were alive, and completed their transformations. With this butterfly it is difficult

to distinguish the sex by the marking on the wings, so I dissected them and the result proved them males.

Again, I found a larva new to me, feeding on the soft maple. I obtained thirty-three good specimens. I was very anxious to rear these, so I watched them closely, and plied them with fresh good food; if one fell or wandered from its food I replaced it, and continued this treatment until they would eat no longer. They went into the earth to undergo transformation, and in ten or twelve days thereafter, the rare, beautiful moth, *Dryocampa rubicunda*, made its appearance. Of these there were twenty-nine females and two males. The remaining two either escaped or died in the earth.

About the time these moths came out, another lot of the same Dryocampa caterpillars was brought to me, but these were purposely neglected. I found them more than once wandering about the box in quest of food; some of these were killed by a parasite, others died from lack of food, so that the result proved only seven males, and no female.

THE FLYING SQUIRREL.

BY PROF. G. H. PERKINS.

Over a year ago, I bought of some boys in central Illinois a pair of flying squirrels (*Pteromys volucella* Des.). They were only a few weeks old but were already quite tame; indeed they had never been otherwise for they were taken before they could run from the nest and so were taught to be tame at the outset. Their habits have been very closely watched since I have had them in my possession, for so amusing and interesting are they that it is quite difficult to be in the room where they are without watching their movements. I have noticed some facts in regard to them which I do not find mentioned in any account that I have seen. Intense activity characterizes them at all times, but it is more intense at some times than at others. In warm weather their movements are generally quicker and their exercise continued much longer than in cold. In summer they are more nocturnal in their habits than at other seasons.