become obnoxious at that date, I think the fact would have been noted in one or other of our entomological journals, and that Cresson would have been fully in touch with it, for his work shows that he had access practically to all the literature to date.

Mayr erected the genus *Iridomyrmex* in 1862,¹ and *Hypoclinea* in 1866.² The species *humilis* figures in his key³ to the genus *Hypoclinea*, published in 1870. Six years later the two genera were combined by him, he having found many connecting forms. The literature of *I. humilis* may be small, but now that the insect has become such a serious economic pest, the mere systematic work of the entomologist will give place to that dealing with the biological side. The able article contributed by Mr. Newell to the initial number of this journal shows that a start has been made along the latter lines and much data gathered on the life-cycle and habits of the insect. With a full knowledge of such life-history, remedial measures may be possible, but the problem will be an extremely difficult one to solve and it goes without saying that every citizen of New Orleans, every sugar, cotton and rice planter, every florist and horticulturist will follow anxiously each step made towards that solution.

23d June, 1908.

NOTES ON SOME CECROPIA COCOONS AND PARASITES

By JOHN B. SMITH, Sc. D.

From a number of collectors reports came during the fall and winter of 1907-'08 of an unusual mortality in *cecropia* cocoons; or, more correctly stated, that an unusual number of the cocoons were "light," with remnants of untransformed larva only. In a discussion before the Newark Entomological Society at its February meeting, it appeared that this trouble was widespread and yet somewhat local. Some collectors reported a very high percentage of sound cocoons in limited areas and a yet higher percentage of "light" examples in others. So there was a great difference in the species, the cocoons of *promethea* and *cyntia* running normal and mostly good. Mr. Brehme reported an unusual dearth of *polyphemus* cocoons and explained that by the statement that an epidemic disease attacked the nearly full-grown caterpillars so that they never spun up at all.

It occurred to me that it might be interesting to learn a little more

¹Myrmecologische Studien, p. 702.

²Ameisen des baltischen Bernsteins.

³Neue Formiciden, p. 959.

accurately the cause of these "light" cocoons and, in this day of discussion of parasites, to determine if possible the relative effectiveness of parasites and other causes in checking the development and increase of certain species.

I therefore asked Mr. H. H. Brehme of Newark and Mr. J. Doll of Brooklyn to gather and send me a lot of these "light" cocoons so that I might at least approximately determine the cause of death of the larvæ that spun them.

Mr. Brehme brought in a lot of 302 cocoons, of which nine turned out to be sound; eighteen were old specimens from which the adults had emerged; forty-two were parasitized and 233 had died in the larval stage, of disease. Of the forty-two that were parasitized only a few were infested by *Ophion*, while the remainder appeared to be infested by some species that makes its cocoons in a mass.

The dead larvæ were in most cases mere shells and were filled with a powdery mass. There was some difference, however, and I judged that at least two kinds of disease organisms had been responsible for death. The interesting feature in the matter is that less than 15 per cent of the deaths had been caused by parasites and over 65 per cent by disease.

It was quite possible to separate out two series of cocoons containing diseased larvæ. In 59 of the 233, the cocoon was incomplete or imperfect; *i. e.*, the inner cocoon was very thin or practically wanting, or the outer cocoon was reduced to a mere covering of loose silk. In other words, the vitality of the larva had not been sufficient to enable the caterpillar to do its spinning work properly, although death did not ensue until after it was completed.

Two lots of cocoons were sent in by Mr. Doll, one consisting of 430 and the other of 330 specimens. Both lots were collected between Maspeth and Laurel Hill, Long Island, one lot, the 430, during the fall of 1907, the second lot, 330, during March, 1908. In the first lot the object had been to collect good cocoons and the obviously light ones were rejected in the field; in the second lot all light cocoons were taken. The first lot was part of a much larger number—over 2,000—collected as probably sound, and the material sent me was that which was sorted out as probably bad when they were again tested at home. In neither case does the material afford any clue as to the actual percentage of infestation; it simply indicates the percentage of the different causes of death.

In the lot collected in 1907, sixteen cocoons were found to contain sound pupæ, and from fifteen adults had issued, leaving 399 that had dead larvæ or pupæ. Thirty-four caterpillars had reached the

pupal stage and died. Of these some had masses of white, fungous-like material with a surface coating of orange powder exuding between the segments. Others were drying up and shrivelling; a few contained a putrifying mass of yellowish material. Of the remainder, 213 were dead as larvæ and of these fifty-four had made light or imperfect cocoons. One hundred and fifty-two were parasitized, and of these twenty had *Ophion* cocoons, the remainder seeming to be Ichneumonids of some kind.

In the lot collected in 1908, eleven cocoons were found to contain sound pupæ and from one the adult had emerged. Thirteen had died in the pupal stage, leaving 305 that had died without pupating. Of these 204 were killed by disease, sixty-one of them making light cocoons, while 101, or less than half as many, were parasitized. Of those that were parasitized, fifty-six contained pupæ of *Ophion*, while forty-five only went to other species.

This little examination is interesting because it calls attention to the relative importance of control factors other than parasites. It gives the results from a lot of 1062 specimens and shows that 697, or more than 65 per cent, were killed by disease in either the larval or pupal stage.

I am quite aware that the statistics are incomplete and imperfect, since the collections were not made of *all* the cocoons in a given region; but as they go, they emphasize the importance of a study of the subject from a new standpoint.

Stated in compact form the results of the study are as follows:

Total number of cocoons examined.....	1062
Sound specimens.....	36
Adults had emerged.....	34
Died as pupæ.....	47
Parasitized	295
Dead from disease.....	650 1062

The above results were secured by early summer and were communicated to the Brooklyn Entomological Society at its June meeting. At that time it was announced that the parasites had begun to make their appearance and that the cocoons would be preserved until the record was complete and nothing further issued.

To all appearance there were two kinds of parasites, the *Ophion macrurum*, which was of course readily recognizable, and an Ichneumonid form, making its cocoons in a solid mass in the lunen of the *cecropia* cocoons. There were seventy-six counted *Ophion* pupæ and from these nineteen adults were obtained. As the *Ophion* speci-

mens in the Brehme lot were not counted, it means that less than twenty-five per cent of the total number matured, and that was not because of any hyperparasitism, but a simple failure of the larva to make a proper pupa. This experience by the by, is not a new one to me. In years past I have cut *Ophion* cocoons in large numbers, finding sound larvæ and pupæ as exceptions only and a putrid brown semi-liquid mass as the rule. Mr. Grossbeck informs me that he has never found anything but the same pasty mass, and therefore it seems that this parasite is kept in check by some disease that reaches it within the body of its host.

Assuming that there were actually eighty *Ophion* parasites, that left remaining 215 *cecropia* cocoons containing massed Ichneumonid cocoons. The number of individuals in these masses was not determined, but there were certainly more than ten, which would make an expectation of 2,000 parasite examples a very moderate one. Instead of that we bred out, *Spilocryptus extremis*, 124 specimens, *Spilochalcis mariae*, 51 specimens; a total of 176 examples instead of the expected 2,000.

But we were not left without specimens for count, because we bred out over 48,000 examples of *Dibrachys boucheanus* or some very closely allied form. The species was referred through Dr. L. O. Howard to Mr. J. C. Crawford, and the determination was received as above, with the statement that this was a hyperparasite on Ichneumonidæ. Mr. Grossbeck actually counted 33,000 of the little specimens and estimated the balance; conservatively, I am certain, for I myself believe that the total was nearer to 50,000 examples. Assuming that the 176 *Spilocryptus* and *Spilochalcis* were the product of fifteen cocoons, that left the nearly 50,000 examples to emerge from 200 cocoons, or 250 examples from each cocoon; twenty-five hyperparasites from every true parasite.

Actually there were over 280 hyperparasites to every primary parasite and this would seem to afford a very decent check to undue increase, so as to prevent the complete extermination of *cecropia* by parasites alone.

This series of notes is published at this time as a suggestion to some of our younger investigators. An extremely valuable set of data can be secured by collecting in some limited locality *all* the cocoons of some of our large *Bombycids*, sorting them so as to separate sound from dead or parasitized forms and sorting the latter so as to separate the different kinds of parasites so far as these may be determined without interfering with their development. Collections should be made in late fall and in late spring to determine the influence of

the winter, and in due time facts would be at hand enabling us to judge intelligently concerning the actual effectiveness of parasitic checks, for some species at least.

There is always a good chance of being misunderstood, hence it may be in place for me to say that I do not mean to suggest that parasites are of no use in checking insect increase. I know that they are. But I do claim that we do not know just where parasites rank in effectiveness as compared with other conditions, and I do claim also that, however much under parasitic control some species may be, that is no proof that therefore all other species may be or are similarly controlled. The contrary proposition is, of course, equally true.

NOTES ON THE LESSER CLOVER-LEAF BEETLE

(*Phytonomus nigrirostris* Fab.)

By C. O. HOUGHTON, Newark, Del.

This species is quite common in Delaware, where, in company with its near relative, *P. punctatus* Fab., it at times does considerable damage to clover.

The earliest date on which I have taken this species in the field in Delaware is April 12; this was in 1906. On that day I found a single brightly-colored specimen several inches down in a hollow weed-stalk, three or four feet high, in a field. I also took, on the same date, about a dozen specimens as they were floating on the water in a small ice-pond near Newark. There must have been several hundred specimens on the pond at this time, as a large number of others were seen. Apparently they had fallen into the water as they were flying over it, possibly due to the fact that quite a strong wind was blowing.

In 1905 my first specimens were taken on May 9, on which date I found three at the bases of clover plants in a sunny spot beside a railroad track. All three specimens were bright and fresh, the green being very brilliant. I placed these specimens together in a shell vial containing a few clover leaves, and soon after noticed two of the beetles apparently pairing. The next day two more specimens were taken and enclosed with the others, and that evening two pairs were observed mating. They did not appear to mind confinement and fed freely upon the clover leaves, eating small irregular holes or slits in them; they also fed somewhat upon the stems.

On the morning of May 11th the pairs were still together, and