nymph ready for the final molt and fully pigmented winged adult is only one day and one-half to two days for individuals, (*Leucotermes* spp.) the quiescent stage lasting several hours.

In conclusion, therefore, it may be stated that in case of *Leucotermes* spp. and *Termopsis angusticollis* Walk., the differentiation of the soldier caste occurs during a molt and quiescent stage rather late in the life cycle of the insect, the larvæ being previously, to all external appearances, undifferentiated.[1]

——In discussion Mr. Banks said that discoveries of Mr. Snyder regarding the metamorphosis of Termites upset the old methods of classification. The change from the metamorphic to the non-metamorphic forms is so gradual that a classification cannot be based on these characters.

——Professor Quaintance asked if a breaking down of the tissues takes place during metamorphosis.

——Mr. Banks said there must be some change in the local parts, but not nearly as much as in the Diptera.

FEEDING HABITS OF PHLEBOTOMUS VEXATOR COQ.

By Raymond C. Shannon, *Bureau of Entomology.*

The following recent observations by Dr. Paul Bartsch and the writer tend to show that *Phlebotomus vexator* feeds normally upon reptiles rather than upon warm-blooded animals.

Late in the evening of July 19, 1913, a large copperhead snake was shot and badly crippled at Plummer's Island, Maryland. It still showed life the following morning when it was found to have numbers of small bloodsucking flies, *Phlebotomus vexator*, feeding upon it. The flies had their beaks inserted between the scales of the snake. Several hours later, (about 10 a.m.), there were still a number of these flies feeding, and some were so heavily engorged that they were unable to fly. Males were present, two being seen in copula with females.

The morning of the same day (July 20), Dr. Bartsch caught a black snake at Paris, Virginia, which had in addition to numerous ticks, a few of these same flies sucking blood in the same manner

[1] Knower, H. McE. Origin of the Nasutus of Eutermes, Johns Hopk. Univ., Circ. XIII, 1894.

above described. These were greatly distended with blood, and were so intent on feeding that he was able to pick them off and place them in alcohol.

One ♂ the first five specimens from which Coquillett described the species, (Ent. News, vol. 18, 1907, p. 102) was found in the early morning on the floor of the cabin at Plummer's Island, beside a blanket on which a person had been sleeping during the night. It was so heavily engorged with blood, supposedly from the sleeper, that it could not fly.

In view of the abundance of *Phlebotomus vexator* about the cabin on Plummer's Island during June and July, it seems remarkable that no observations of its attacking man, have been made. Its nocturnal habit, with possibly a painless bite and silent flight, may explain this. Another species found in Guatemala, *Phlebotomus cruciatus* Coq., was observed by Mr. Barber to bite man and cause annoyance, (see note by Barber, Proc. Ent. Soc. Washington, vol. 8, 1906, p. 102).

In India a species of *Phlebotomus* has been observed sucking the blood of a toad. (Maxwell Lefroy, H., A Preliminary Account of the Biting Flies of India, 1907 p. 16).

——Mr. Knab said that Mr. Shannon's observations were very interesting in that they showed a well marked difference in the feeding habits of the different species of *Phlebotomus*. This is strikingly confirmed by observations recently made in another part of the world. It is recognized that *Phlebotomus papatasii* of the Mediterranean region, which is the vector of the so-called pappataci fever, is associated with man in much the same way that are certain species of mosquitoes, frequenting houses and the females sucking his blood. It has been assumed that the other species of *Phlebotomus* also readily attack man. F. M. Howlett, in a paper which has just come to hand, now shows that another species common in the Orient has a marked preference for the blood of Geckos (Indian Journ. Med. Research, vol. I, pp. 34–38, pl. 9; July, 1913). Howlett states that *Phlebotomus minutus*, in its biology, is closely associated with these lizards. He shows that the geographic distribution of *Phlebotomus minutus* and of the Geckonidæ correspond very closely. Furthermore, *Phlebotomus minutus*, whether in houses or out-of-doors, is always associated with the Geckos, and it is useless to seek it elsewhere. The larvæ

of *Phlebotomus minutus* are found in crevices between bricks and stones, where the Geckos hide and where the excrement of the lizards furnishes them suitable nourishment. But the association with the Geckos is closest in the adult females, as these normally suck the blood of the lizards. "In a bungalow in which *P. minutus* is fairly abundant, careful examination of the lizards on the wall, at almost any time of day or evening, may reveal that perhaps every other lizard has a sand-fly perched on its back and sucking its blood. . . . I believe that there is no doubt that the flies have a distinct preference for biting lizards as compared with men; that they are, in fact, primarily parasites of the lizard. To us they are troublesome only in the hot months, generally in the late evening or very early morning, and it is extremely difficult to get them to bite the hand or arm in the laboratory during the day. Geckos confined with sand-flies are, on the other hand, freely bitten at any hour of the day, as well as in the evening, and one lizard may have several flies biting at once, this may happen, moreover, just after the flies have completely refused to bite a human wrist."

Professor Quaintance exhibited specimens of cranberries having numerous galls on the leaves and asked for information as to what was the cause of the peculiar growth. Mr. Banks suggested that it might be caused by the mite, *Eriophyes vaccinii*, or some Cecidomyiid.

——Mr. Banks exhibited specimens of a Psyllid, *Livia marginata* Patch, taken near Falls Church, Virginia, on the leaves of a sedge. This species was figured by Miss Patch in Psyche from two specimens from Connecticut. The insect deforms the lower leaves of the sedge to form a tuft of white leaves that are very prominent.

——Mr. Knab discussed the life history of *Dermatobia*. Infestation of man with the larva is common in the American tropics and the larvæ are also common in cattle, horses, and other mammals. Nothing has been known of the manner of infestation, and it has been assumed that the eggs are deposited directly on the host. The probability that the infestation is not direct was indicated by the large number of eggs (750 to 800), found by Neiva in dissections. Now Surcouf of Paris has received South American

mosquitoes (*Janthinosoma*) with clusters of eggs of *Dermatobia* attached beneath the wings. It would appear, then, that the eggs hatch and the larvæ are transferred to the host, while the mosquito sucks blood. As to the manner in which the eggs are attached to the mosquito, Surcouf accepts the explanation of Gonzales-Rincones of Venezuela, who had transmitted the specimens. The latter is credited with a statement that the eggs, along with a viscous substance, are deposited upon the foliage and that they become attached to the mosquito accidentally as it walks over the leaf. This explanation, the speaker said, he could not accept. The eggs were found attached to a part of the mosquito's body which does not come near the leaf surface when the mosquito rests upon it; also the eggs are attached in a definite way by their bases and with the hatching end outward, and this could hardly be accomplished accidentally. Furthermore, under the circumstances assumed, the eggs for the most part would be picked up by other insects, which would not bring about their transfer to a suitable host. There is no reason to doubt that the eggs discussed by Surcouf are really those of *Dermatobia*, and his statement shows that these eggs have been repeatedly found attached to mosquitoes. Remarkable it is that in every case the mosquito appears to have been a *Janthinosoma*. Prof. Urich, of Trinidad, has called Mr. Knab's attention to the fact that he has also found *Janthinosoma* with the eggs attached, and that in 1905 he sent such a specimen to the Bureau of Entomology, but that he received no satisfactory explanation.

——Dr. Martini gave a short address, thanking Dr. Howard and other members of the society for the help they had given him. He stated that before leaving Hamburg, he had been informed that he would be able to obtain much assistance while here, but he found upon his arrival even more help than he had anticipated.

——Dr. Howard gave a brief account of his western trip in company with Dr. Marchal, mentioning a few incidents that occurred during the journey.

——Mr. Schwarz spoke of the occurrence of *Psylla buxi* Linn. He said he had observed this insect in great numbers at Atlantic City many years ago. Mr. Banks said that he had taken this insect two or three years before in New York City on box hedge.