

A NOTE ON THE PARASITES OF THE COCCIDÆ.

BY L. O. HOWARD.

Dr. Bergroth in a recent letter has called my attention to certain statements made by C. Aurivillius in a paper entitled "Ar-rhenophagus, ett nytt slagte. bland Encyrtiderna," published in *Entomologisk Tidskrift*, Volume IX, Nos. 3-4, 1888, concerning the economy of some parasites of bark lice. Owing to my unfamiliarity with the Swedish language, I was acquainted only with the Latin descriptive portion of this paper up to the time of receiving Dr. Bergroth's letter. Mr. Linell has since done me the favor to translate Aurivillius' general remarks, from which I may quote as follows :

Since a few years occupied with the study of our Coccids, I have also paid attention to the peculiar forms of the family Pteromalidæ that are parasites of the Coccids. These parasites, that belong to the groups Encyrtinæ and Aphelininæ, are generally obtained out of the Coccus female, at the same time or somewhat before the eggs beneath them are hatched, and they appear not in any way to check the development of the Coccus female or diminish the number of the eggs laid by her. These parasites do not, therefore, ruin for themselves their food supply through killing and exterminating their hostesses and their progeny, like most other parasites do, but are satisfied with the excess of food that is on hand. Different is the case with the species that parasitize in the male larva of the Coccids. These destroy entirely the male larvæ. That this is the truth is most easily proven with those species whose male larvæ almost from the very start are different from the female larvæ. This is the case especially in the species of the genus *Chionaspis*, whose male larvæ are covered with a narrow shield with parallel sides, while the shield of the female larvæ is broader. In regard to other genera, for instance in the family Lecaniidæ, that have in the first stage similar larvæ (in both sexes), it could be advocated that the larvæ attacked and killed by the parasites even might be female larvæ, although checked by the parasites in their development, so that they never had a chance to become larger than the male larvæ. A case that might be thus interpreted I have observed in *Physokermes hemicyphus* Dalm. On a small low spruce shrub I discovered (in Roslagen) last summer females of this species in great numbers attached in the usual way in the lower leaf angles of the second-year shoots. But on the leaves of the same shoots were found here and there some quite small parallel-sided coccids which I considered male larvæ and carefully preserved in the hope of obtaining out of them the hitherto unknown male. I was disappointed in this, and got from nearly one hundred small coccids that I collected from the leaves only a small parasitic Hymenopter (*Aphycus* sp.), one out of each. In this case either every one of the collected male larvæ has been attacked by a parasite, or we must

suppose that those *Physokermes* larvæ, which already when quite young felt themselves attacked by the parasite, did not seek the usual place in the axils of the lower leaves but attached themselves on the leaves. It is worth mentioning that I never obtained the above-mentioned *Aphycus* species from the developed females of *Physokermes*.

My own experience with the Encyrtinæ and Aphelininæ infesting Coccidæ has been rather extensive, and I have taken an especial interest in these insects since the publication of my paper in 1880 on the parasites of the Coccidæ. This experience leads me to believe that Aurivillius' generalization will not hold. In certain cases, such as those which he specially mentions, the males may be exclusively attacked and in others the majority of the eggs may be laid upon the female sufficiently late to enable her to oviposit as freely as if she had not been attacked. In many other cases, however, and these form the majority in my experience, the females are pierced by their parasites at all stages of growth, and when thus pierced growth is arrested. For example, in the case of the common cosmopolitan *Lecanium hesperidum*, which here at Washington is extensively infested by *Coccophagus lecanii*, the female Coccid blackened by the contained parasite may be found at almost all stages of growth, at the proper season of the year, upon almost any ivy leaf which one may examine. From the smallest of these infested individuals but a single specimen of the *Coccophagus* will be reared, while from the largest as many as six parasites may issue. Again, the very common *Aphelinus mytilaspidis* issues frequently from the females of *Mytilaspis pomorum* before they have passed the last moult; an undescribed species of *Aphycus* has been reared from females of *Chionaspis euonymi* before these have reached maturity, and it is a common thing to rear small specimens of *Comys fusca* from immature specimens of several species of the hemispherical group of the genus *Lecanium*. In fact, a glance through the collection of Coccidæ in the National Museum reveals so many instances of this kind that it would be wearisome to note half of them. I am convinced, therefore, that as a generalization Professor Aurivillius' statement is not warranted, however true it may be of the *Aphycus* which he has reared from *Physokermes* or of his most peculiar and interesting genus *Arrhenophagus* infesting *Chionaspis salicis*.

Prof. Riley said he could confirm all Mr. Howard's remarks from his own experience, and that there could be no question but that Aurivillius had made but fragmentary observations and generalized from them. Mr. Ashmead agreed with the previous speakers and described a peculiarity in the male of *Physokermes* which would make this sex much more liable to parasitism than