A NOTE ON THE OCCURRENCE OF ABDOMINAL SPIRACLES IN THE COCCIDÆ. (HEMIPTERA).

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Abdominal spiracles have been noted in but a limited number of species of Coccidæ and when noted seem usually either to have been passed over as of no particular significance or to have been regarded as evidence that the forms possessing them are merely aberrant. Savage, (1) who has described the tracheal system of *Monophlebus stebbingi* var. *octocaudata* Green, seems to have believed that the abdominal spiracles in this species are an adaptation to meet the needs occasioned by the extraordinarily large size of this particular insect. In a few cases they have been regarded as of some taxonomic significance. The genus *Perissopneumon* Newstead was based partially upon the fact of their presence and they are noted among the generic characters of the genera *Stigmacoccus* Hempel and *Cryptokermes* Hempel, while Pergande based his sub-family Xylococcinæ partially upon them, stating (2) that, "In the true Monophlebinæ the abdominal stigmata are wanting or not observable: . . ."

Newstead (3) stated in 1901 that abdominal spiracles are present in *Stigmacoccus* and *Perissopneumon*, but that, . . . this peculiarity does not exist in any other Coccid," and Savage (ref. cit.) repeated this statement in 1914. As a matter of fact it was erroneous when first made for such spiracles had been recorded in the case of *Cryptokermes brasiliensis* Hempel, which was described in the same paper as was *Stigmacoccus*, in the case of *Xylococcus betulæ* Perg. and also in some of Maskell's species of *Cælostomidia* (= *Cælostoma*). In 1903 Newstead (4) recorded the discovery of abdominal spiracles in certain species of *Orthezia*, stating that, "The presence of abdominal spiracles in the three species of *Orthezia* hereafter described is a marked characteristic, and one which has not hitherto been observed in this sub-family of Coccidæ." Here he was again in error, for the abdominal

(1) Savage, R. E. The tracheal system of *Monophlebus stebbingi* var. *octocaudata*. In Bul. Ent. Res. 5: 45-7: pls. 5-9. (1914).

(2) Pergande, T. Bul. 18, u.s., U. S. Dept. Agric., Div. Ent., p. 26. (1898).

(3) Newstead, R. Mon. Brit. Coccidæ, vol. 1: 15. (1901).

(4) Newstead, R. Mon. Brit. Coccidæ, vol. 2: 227. (1903).

spiracles of *Orthezia cataphracta* (Shaw), one of the three species discussed by him, had been noted by List (5) in 1887 in an exhaustive paper dealing with the anatomy of this species. However, Newstead does, indeed, appear to have been the first to note their presence in any other species of this genus.

As far as I am at present able to determine the following list includes at least the genera in which abdominal spiracles have been noted, although it probably does not include all the species, some descriptions not being accessible. In the subfamily Monophlebinae there are recorded the genera *Stigmacoccus* with one species, *Perissopneumon* (perhaps not a synonym of *Stigmacoccus* as it has been regarded) with two species, and one species of *Monophlebus*. In the Margarodinae there are the genera *Xylococcus* with four species, *Stingelia* with two, *Stomacoccus* with one, some of the species of *Margarodes*, and at least two of *Cælostomidia*. In the Dactylopiinae there is but the monotypic genus *Cryptokermes*. In the Ortheziinae there are three species of *Orthezia*.

On the face of these records it would appear that the presence of abdominal spiracles has indeed but little significance and their occurrence might well be taken as evidence of aberrancy, the more so as most of the species in which they are recorded are curious enough in other respects as well. However, an examination of even the limited number of species available to me for study has shown that these records are extremely misleading. In short, abdominal spiracles are present in several forms in which they have not been noted and are in all probability present in many others.

The most surprising fact is that they appear to have been overlooked in such a well known species as *Icerya purchasi* Maskell, as well as in at least two other species of this genus. In *I. purchasi* Maskell two pairs are present, while in *I. seychellarum* (Westw.) and *I. aegyptiaca* (Dougl.) there are at least three. The original description of *I. jacobsoni* Green is not available and I do not know if they have been noted in this species, but in specimens from the Philippine Ids. (det. Cockerell) there are at least two pairs. In all these species the spiracles are situated toward the posterior

(5) List, J. H. *Orthezia cataphracta* Shaw. In *Arbeiten a. d. zool. Inst. zu Gratz*, 1 : 5 : 201-278 : pl. 1-6. (1887).

end of the abdomen. It is, perhaps, after all, not so surprising that they have not been observed for they are quite small and difficult to find among the many pores, spines and cicatrices, even in well stained preparations, but that they are really spiracles has been clearly demonstrated for it is possible to see the tracheæ proceeding from them.

Three other species belonging to the Monophlebinæ are at hand, these including *Paleococcus plucheæ* (Ckll.), *Drosicha burmeisteri* (Westw.), (det. Kuwana) and *Drosicha corpulenta* (Kuwana), and in none of these have abdominal spiracles been recorded. My single specimen of *Paleococcus plucheæ* (Ckll.) shows at least one pair but is in too poor condition to decide whether or not there are more. Both the species of *Drosicha* show seven clearly distinguishable pairs.

Of the species of Margarodinæ in which these spiracles have not been noted there are at hand specimens of *Kuwanina quercus* (Kuwana) and *Kuwanina* (?) *zeylanica* (Green). In the former there appear to be but four pairs, these being on the anterior segments, and in the latter there are eight, of which the posterior two are so much reduced as to amount to but little more than points of attachment for the tracheæ.

In the Ortheziinæ abdominal spiracles have been seen only in the three species noted by Newstead, *O. insignis* (Dougl.), *O. cataphracta* (Shaw) and *O. urticae* (Linn) but they are present in *O. californica* Ehrh., *O. galapagoensis* Kuwana and in an undetermined species of which I have specimens. In *O. californica* I note seven pairs, but in the other two species examined by me the material is in too poor condition to permit conclusions as to the real number. Newstead apparently does not state the number in the species examined by him, but List has recorded seven pairs in *O. cataphracta* (Shaw). Newstead states that he has not been able to trace them in *Newsteadia floccosa* (De Geer), nor have I been able to find them in *Nipponorthezia ardisiæ* Kuwana.

The monotypic genus *Cryptokermes* Hempel, which possesses abdominal spiracles, forms an extremely discordant element even in such an aggregation of disharmonies as the subfamily Dactylopiinæ (of the Fernald Catalogue) to which it is now referred. Specimens of *C. brasiliensis* Hempel, (Mexico, det. Cockerell) are

at hand and are sufficient to show that the species has been thoroughly misunderstood and that it cannot be referred to this subfamily. It is, in fact, a member of that group, whatever it may eventually be called, that includes the present subfamilies Monophlebinæ and Margarodinæ, although it cannot be referred to either of these groups as they are at present defined for it seems to combine the characters of both. I shall discuss the species at some length in a later note.

The facts here presented are too few to permit of any very sweeping generalities, yet they are suggestive enough and I present them at this time, in spite of their fragmentary character, in order to call attention to them and to their possible significance.

It will be noted that, with the exception of the species of *Orthezia*, all the forms in which these spiracles have been noted belong to the two subfamilies Monophlebinæ and Margarodinæ. Conversely, it is possible, if indeed not probable, that all the members of these groups will eventually be found to possess such organs. It, therefore, appears that we may have available a taxonomic element that has not been fully utilized and that may throw a considerable amount of light upon the relationships of these forms. Whether or not the presence of abdominal spiracles is any evidence of a close relationship between the Ortheziinæ and the other two subfamilies remains to be seen, but there is some other evidence that the present division between the Monophlebinæ and the Margarodinæ is by no means as clear as it has been thought.

The Board of Regents of the University of Minnesota at their meeting on January 18th elected Dr. W. A. Riley, of Cornell, Professor of Parasitology and Chief of the Division of Economic Zoology. Associate Professor A. G. Ruggles was, at the same time, appointed Station Entomologist, which position carries with it the office of State Entomologist. At the December meeting of the Board Professor F. L. Washburn, who has held the position of State Entomologist in Minnesota for nearly sixteen years, asked and obtained permission to be relieved of that position and its attendant police duties, and the action of the Board on the 18th was necessary to fill the vacancy thus caused.