

originally borne on the eighth, ninth and tenth sternites respectively, and homologizes them with paired styli borne on the eighth, ninth and tenth sternites of the male. While all three pairs of styli persist in the female (the pair originally borne on the tenth sternite migrating to a position on the ninth, in the female), only the pair borne on the ninth sternite persist in the male, the other pairs gradually disappearing as development proceeds. It must be admitted that Wheeler's choice of *Xiphidium* was an extremely unfortunate one, since the genitalia of the males of these insects are too highly modified to give the best results for such an investigation; and until the ontogenetic development of more favorable forms, such as the Ephemera, sawflies, etc., have been studied with a view to determining the interpretation of the parts in male insects, we must conclude that the evidence available is not entirely satisfactory, especially since Heymons, Palmen, and others who have also traced the development of the parts in males of lower insects, do not agree with Wheeler in many particulars.

A study of the so-called gonopods, or arthrostyles,* borne on the ninth abdominal segment in trichopterous larvæ, has convinced me that these structures form the claspers or gonopods of adult male caddice-flies (i. e., the structures labeled "c" and "b" in Fig. 2), and since these structures are evidently appendages of the ninth abdominal segment (not of the tenth abdominal segment, as was stated in the article published in *Psyche*) in caddice-fly larvæ, I would interpret the outer claspers of the genitalia of the males of higher insects as appendages (styli) of the ninth abdominal segment. On the other hand, the penis valves may or may not belong to the same segment, although I am inclined to interpret them as appendages (endopodites ?) of the ninth abdominal segment also.

If the structures labeled "a" and "b" in Fig. 1 are homologous with those labeled "a" and "b" (with "c") in Fig. 5, and if these in turn are homologous with the structures labeled "a" and "b" (with "c") in Fig. 3, it is quite evident that there has been a considerable shifting of the parts in the different insects under consideration. Thus, in the roach shown in Fig. 1, the styligers or "coxites" labeled "a," instead of tending to remain more or less distinct as in the Ephemera ("a" of Figs. 4 and 5), become more closely united with the ninth sternite "9" of Fig. 1, while the penis valves "d" are apparently attached behind the posterior border of the ninth sternite—which has either grown out posteriorly beneath them, or the penis valves have been shifted forward basally. If the structures bearing the label "d" in Fig. 1 are the homologues of the penis valves of the other insects figured, they have followed a line of specialization leading toward the asymmetrical development of the parts, and their relation to the styli or gonopods "a" and "b" is somewhat different from that occurring in the higher insects.

Another course of development has apparently been followed in the sawfly shown in Fig. 3, since the ninth sternite "9" (which does not project far posteriorly in the ephemerid shown in Fig. 5, "9") has grown outward and back-

*In the larvæ of certain sawflies such as *Neurotoma*, there occur near the base of the sternite of the tenth abdominal segment, a pair of jointed appendages which I interpreted as segmented styli (arthrostyles) from the fact that they are borne on the sternum of the segment. Mr. Middleton, however, informs me that these apparent arthrostyles are transformed into the cerci of the adult male insect, and if this be correct, the structures in question should be designated as cerci rather than as styli (or arthrostyles) in these larvæ.