Lewis Berner

Excerpt from Canadian Entomologist, August, 1939.

SOME GYNANDROMORPHS OF EPHEMEROPTERA

BY H. T. SPIETH* AND F. P. IDE**

Gynandromorphs have been reported from many orders of insects and especially from those orders in which large numbers of individuals have been collected or reared. It is therefore not surprising that, with the accumulation of large series, ephemerid gynandromorphs should be found occasionally and it seems advisable to put descriptions of such individuals on record. Needham, Traver, Hsu, etc. (Biology of Mayflies, p. 114) described a gynandromorph of the *interpunctatum* group of the genus *Stenonema*. The specimens described below are ones that have been found in the collections of the authors of the present paper. The description of the gynandromorph of *Leptophlebia* is by F. P. I. and those of *Stenonema* and *Potamanthus* are by H. T. S.

Leptophlebia mollis Hag.

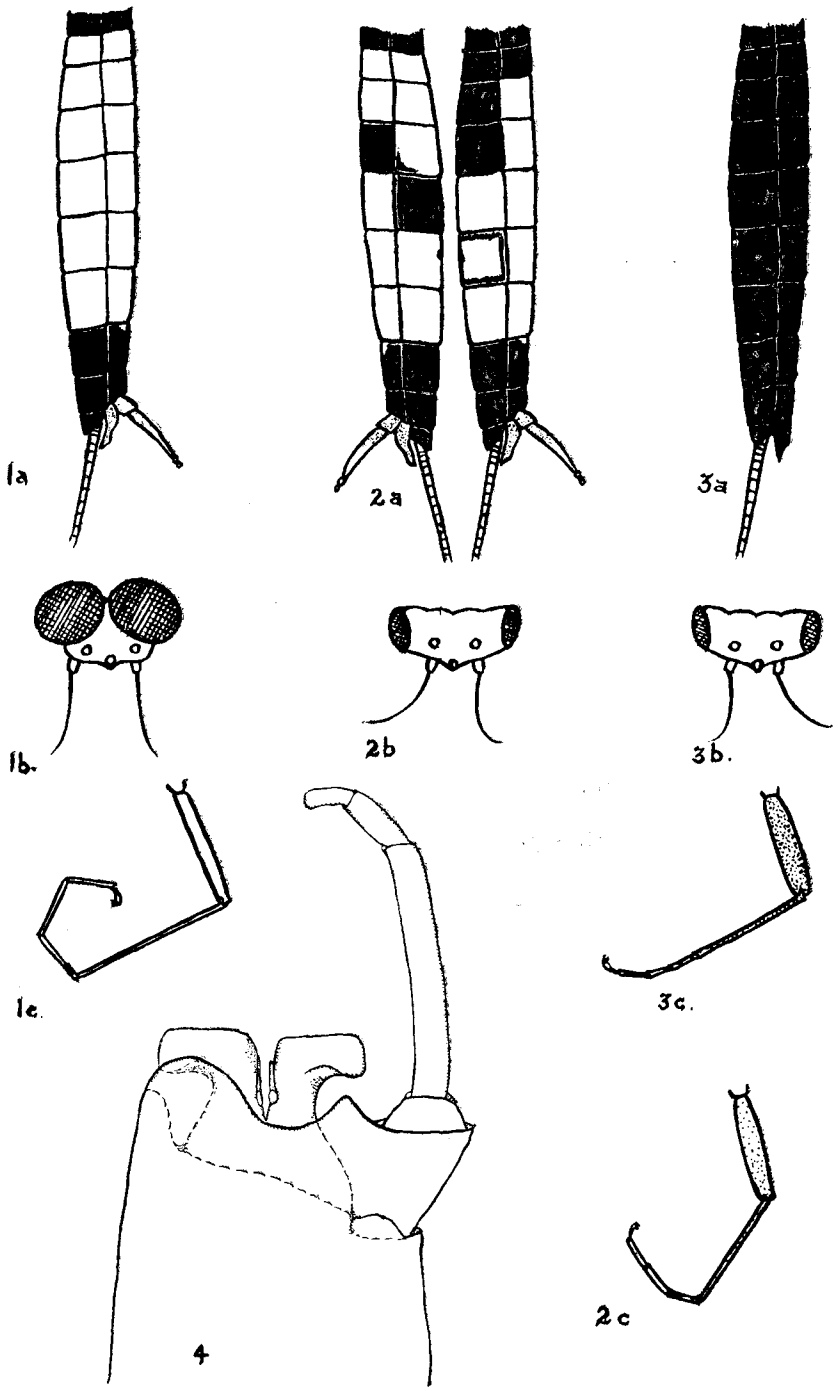
The specimen was found in a collection of mayflies made by F. P. I. at Lachine, P. Q., on June 5, 1933. In this species as in most mayflies there is marked sexual dimorphism involving the forelegs, the compound eyes, the colour of the abdomen and the external genitalia.

In the normal male (Fig. 1 a, b, c) the compound eyes are large and almost contiguous over the vertex of the head, whereas in the normal female (Fig. 3 a, b, c) the compound eyes are small, the width of the vertex being about four times the width of the eye. In the male the fore-legs are long, the femur being nearly twice as long as that of the female and the other segments correspondingly longer. The fore-femur in the male is hyaline white and that of the female is tinged with brown. Abdominal segment one of the male is dark reddish brown on both tergum and sternum. Segments 2 to 7 inclusive are hyaline white throughout and segments 8, 9, and 10 are reddish brown above and below. In the female on the other hand, the abdominal segments are uniformly reddish brown. The male has jointed claspers or gonapods borne by the sternum of segment 9, with the penes opening dorsal to them. The female has the opening of the oviduct between sterna 7 and 8 and lacks gonapods.

In the gynandromorphic individual (Fig. 2 a, b, c) there is a mixture of male and female characters. The eyes are small as in a female individual and not intermediate between the two sexes. The forelegs are short as in the normal female, but are slightly longer than in this sex. The fore-femora are tinged with brownish as in the female. The left hind leg is about one-half the length of the right hind leg, apparently a regenerated limb. The abdomen is very curiously marked in a piebald fashion in brown and hyaline white. Segment 2 hyaline white on the left side from the mid dorsal line to the mid ventral line, and reddish brown (as in female) on the right side. Segment 3 evenly reddish brown on the right side from the mid dorsal line to the pleural fold, hyaline white from the pleural fold to the mid ventral line and hyaline white on the left side. Segment 4 reddish brown from the mid dorsal line to the pleural fold and hyaline white below the fold to the mid ventral line on the right side; left side hyaline white from the mid dorsal line to the pleural fold with the exception of a very restricted reddish brown patch in the postero-lateral angle and evenly reddish brown from the pleural fold to the median ventral line.

*The College of the City of New York.
**The University of Toronto.

PLATE 24



Figs. 1a, 1b, 1c: Abdomen, head, and foreleg of normal male of *Leptophlebia mollis.*
Figs. 2a, 2b, 2c: Same structures in a gynandromorphic individual of *L. mollis.*
Figs. 3a, 3b, 3c: same structures in normal female of *L. mollis.*
Fig. 4: Genitalia of a gynandromorph of *Stenonema terminatum.*

Segment 5 hyaline white throughout on the right side and from the pleural fold to the median ventral line on the left side; evenly reddish brown from the mid dorsal line to the pleural fold on the left side. Segment 6 hyaline white except that on the right side only there is a narrow reddish brown line along the mid dorsal line continued as a narrow line along the anterior and posterior margins of the segment from the mid dorsal line to the pleural fold. Segment 7 hyaline white throughout. Segments 8, 9, and 10, as in the normal male. The gonapods and claspers are well developed and, as far as can be made out, similar to those in the normal male as are also the penes. This individual has definitely the characters of a female at the anterior and those of a male at the posterior end.

No eggs are visible within the abdomen, and presumably testes are present, or there may be no gonads developed.

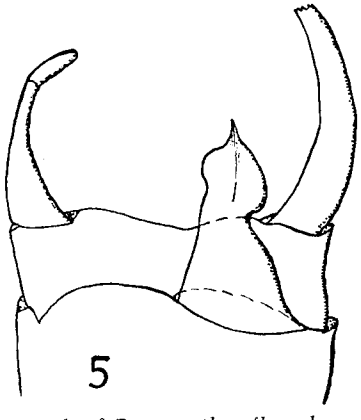


Fig. 5: Genitalia of a gynandromorph of *Potamanthus flaveola*.

Stenonema terminatum Walsh (dried)

The specimen was collected by H. T. S. at Murphy, North Carolina, April 23, 1935. It is about half male and half female. The coloration is that of a typical male with the exception of the head which is pigmented like that of a female. The head is in all respects that of a female except for the eyes which are somewhat larger than those of a normal female. The thorax and all of its appendages are typically masculine. The abdomen appears to be masculine except that: (1) Eggs can be clearly observed occupying the dorsal portions of segments one to seven inclusive. These eggs masses are, however, only about one-third the volume of those found in normal females. (2) The genitalia (fig. 4) are incomplete. Only the right forceps limb is present. Basally this limb is attached to a plate which, on the right side, appears as a normal styliger plate and on the left side appears to be part of a female subanal plate. Distally the penes appear normal, but basally the attachment is considerably distorted on the left side, although it is normal on the right side. There are no indications of oviducts or oviducal apertures which are normally to be found between the seventh and eigth segments.

Stenonema rubromaculatum Clemens (in alcohol)

The specimen was collected at Binghamton, New York, June 15, 1938, by Dr. Virgil N. Argo who kindly presented it to H. T. S. Its head is completely feminine. The right half of the thorax, including the wing, is clearly that of a female. This can be determined by the coloration as well as by the structure. Unfortunately, as often happens when heptagenines are preserved in fluid, the legs have broken off at the trochanters. Since this specimen was only one out of a large series, it is impossible to tell exactly what the legs of the right side were like. The remaining coxae and trochanters have coloration typical of a female. The left half of the thorax and the left wing are clearly masculine both

in structure and pigmentation. The left fore-leg is missing, but left meso- and metathoracic legs are present and the latter, plus the coxa and trochanter of the fore-leg, are clearly masculine. The entire abdomen is that of a male normal in all respects.

Potamanthus flaveola Walsh (in alcohol)

The specimen was collected at Wyandotte, Oklahoma, April 4, 1934, by the Oklahoma Natural History Survey. In this species, the sexual dimorphism is greater than in most species of *Potamanthus.* Thus the compound eyes of the males are larger than those of the females, and the cross veins of the wing disk of the males are colorless, while those of the females are blackish. In this particular specimen the head, thorax and the thoracic appendages are clearly feminine.

In the abdomen the left ovary is developed normally. The entire left side is full of apparently normal ova. On the right side of the abdomen there appears to be no ovary present. The ninth abdominal segment (Fig. 5) bears an incomplete male genital apparatus. The left half of the genital apparatus seems normal to all appearance. Unfortunately the tip of the left forceps had been broken and thus it is impossible to determine whether it was completely normal. On the right side the penes are completely lacking, and the forceps is obviously not normal, being short and having only a single distal segment instead of two as are normally present. The duct leading into the normal left penis is, interestingly enough, filled with ova.

SIGNIFICANCE

Since the ancestry of these specimens is unknown, it is scarcely worth while to speculate upon the cause or causes of their origin. It should be noted that the amount of femaleness and maleness in each specimen varies between individuals. Thus, the specimen of *Leptophlebia mollis,* while female at the anterior and male at the posterior end, shows a peculiar mosiac appearance in coloration of the abdomen. Likewise the bisexuality of the specimen of *Stenonema rubromaculatum* involves both structural and pigmentary characteristics. In the case of *S. terminatum,* however, the bisexuality involves the structure of the head and abdomen only.

In the light of what has been found in other insects, such variations in bisexuality between individuals is to be expected. Further, in the future we may expect to discover individual ephemerids that show varying degrees of bisexuality. Lastly, the bilateral bisexuality of the posterior end of the abdomen of *S. terminatum* (fig. 4) indicates that the styliger plate of the male genitalia is the homolog of the subanal plate of the female.